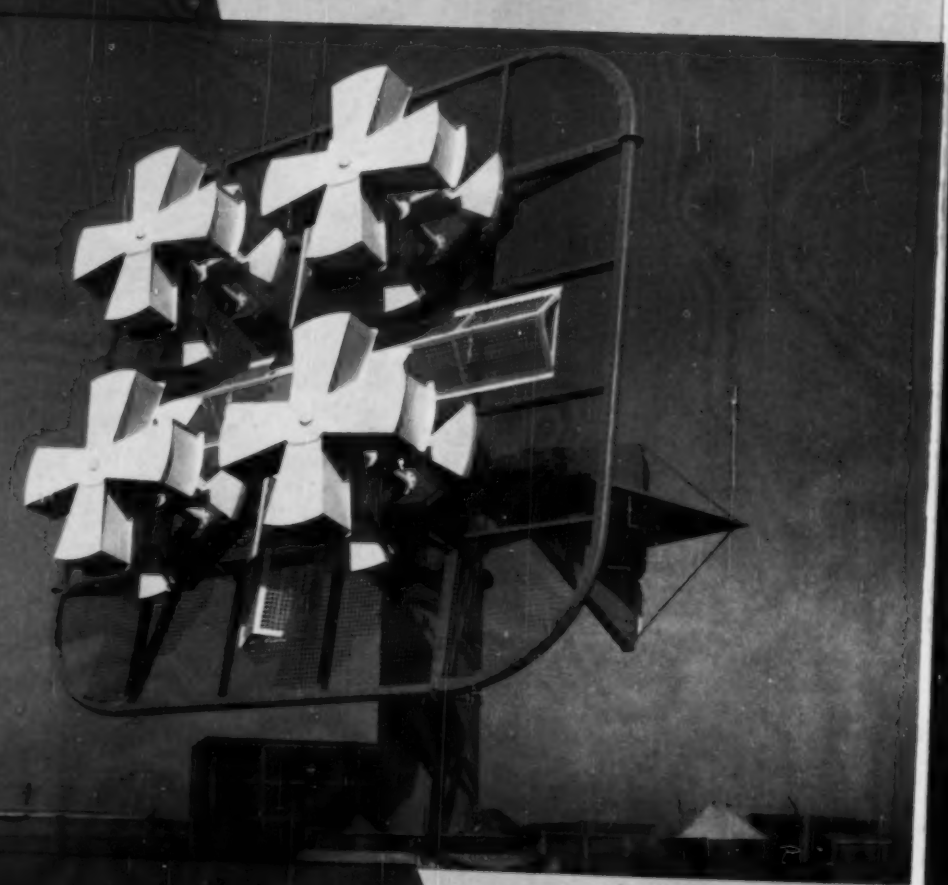
Eugene B. Power
Universal Microfilms
313 N. First St.
Ann Arbor, Mich. -1

INDUSTRIAL QUALITY CONTROL



QUALITY through Scientific Methods

JOURNAL OF THE AMERICAN SOCIETY FOR QUALITY CONTROL

NOW—after 4 years of intensive research...

THE BIG BASIC GAP IN QUALITY CONTROL IS FILLED BY Q-TROL 60-D!

FIRST AND ONLY LOW-COST, HIGH-RELIABILITY QUALITY CONTROL COMPUTER UTILIZES WALD'S SEQUENTIAL ANALYSIS THEORY FOR SCIENTIFIC SAMPLING OR CLOSED LOOP PROCESS CONTROL, ELECTRO-MECHANICALLY, IN ANY BUSINESS!

Some four years ago DIVERSA ELECTRONICS' electrical and mechanical engineers were given a highly challenging assignment: Convert Wald's Theory of Sequential Analysis into a completely reliable Electro-Mechanical Quality Control Computer that can sell for about $1,500, eliminate the human factor in decision-making, reduce paper work to a bare minimum, be adaptable to any size and type business.

The challenge was met *and surpassed* with Q-Trol Model 60-D, which sells for LESS than $1,500, and performs these functions AUTOMATICALLY: 1) Analyzes "good" or "bad" sample information accurately and swiftly while holding sample size to minimum; 2) Evaluates products according to manufacturers' pre-set standards; 3) Makes correct decisions, then signals with RED or GREEN light whether or not LOT is acceptable; 4) Almost completely eliminates laborious paper work, including data-recording and curve-plotting; 5) Operates with only one unskilled worker; 6) Can be used in closed loop process control, or with automated equipment; 7) Works in atmospheres up to 120 degrees Fahrenheit; 8) Performs with equal efficiency in all businesses.

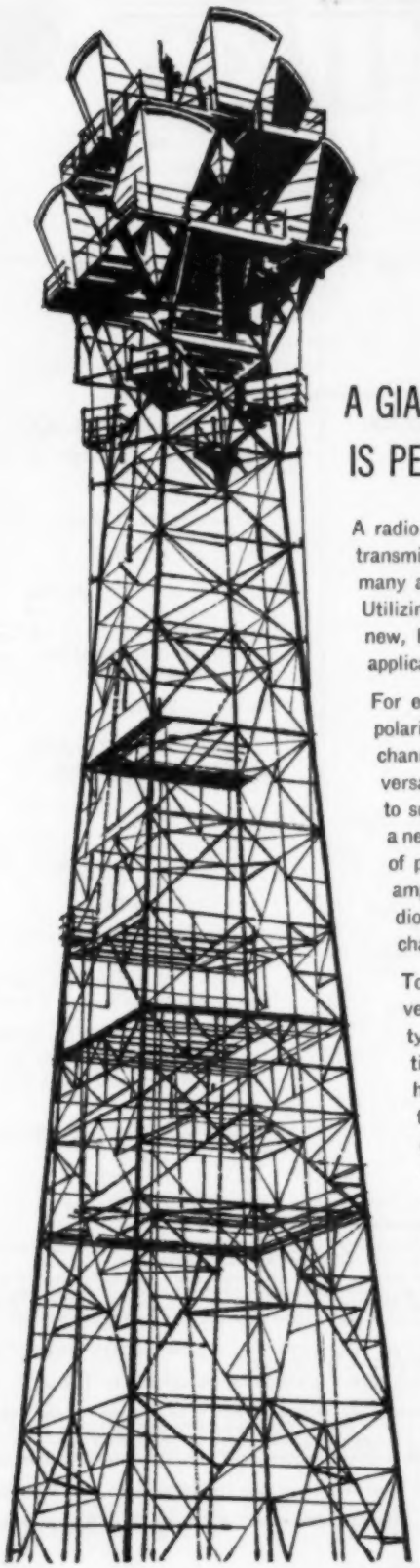
FOR ILLUSTRATED BROCHURE, DEMONSTRATION OR INFORMATION ON YOUR SPECIFIC APPLICATION, MAIL COUPON TODAY!

DIVERSA ELECTRONICS, INC.
5114-F W. Jefferson Blvd.
Dallas 11, Texas

☐ Please send me FREE Q-Trol Brochure.
☐ I would like a Q-Trol demonstration. Have a representative call to explain Q-Trol's application to my business.

Name_____ Title_____
Firm Name_____
Address_____
City, Zone, State_____
We manufacture_____

DIVERSA ELECTRONICS INC.
A Subsidiary of Diversa, Inc.
5114-F W. JEFFERSON · DALLAS 11, TEXAS · FE 9-9351



A GIANT RADIO HIGHWAY IS PERFECTED FOR TELEPHONY

A radio relay system operating at 6 billion cycles per second and able to transmit 11,000 voices on a single beam of microwaves—several times as many as any previous system—has been developed at Bell Laboratories. Utilizing the assigned frequency band with unprecedented efficiency, this new, heavy-traffic system was made possible by the development and application of new technology by Bell Laboratories engineers and scientists.

For example, they arranged for the waves in adjacent channels to be polarized 90 degrees apart, thus cutting down interference between channels and permitting the transmission of many more telephone conversations in the same frequency space. They developed ferrite isolators to suppress interfering wave reflections in the waveguide circuits; and a new traveling wave tube that has ten times the power handling capacity of previous amplifiers and provides uniform and almost distortionless amplification of FM signals. They devised and applied a new high-speed diode switching system which instantly switches service to a protection channel when trouble threatens.

To transmit and receive the waves, the engineers applied their invention, the horn-reflector antenna. Elsewhere, this versatile antenna type is brilliantly aiding space communication research in the reception of radio signals from satellites. For radio relay, a single horn-reflector antenna can efficiently handle both polarizations of the 6000 megacycle waves of the new system; at the same time it can handle 4000 and 11,000 megacycle waves used for existing radio relay systems. Thus it enables all three systems to share economically the same radio towers and routes.

Produced by the Bell System's manufacturing unit, Western Electric, the new system is now in operation between Denver and Salt Lake City, and will gradually be extended from coast to coast. This new advance in radio technology is another example of how Bell Telephone Laboratories works to improve your Bell communication services.

BELL TELEPHONE LABORATORIES

World center of communications research and development

Editorial Board

MASON E. WESCOTT, *Chairman*
Rutgers • The State University, New Brunswick, N. J.

RICHARD S. BINGHAM, JR.
The Carborundum Co.

IRVING W. BURR
Purdue University

CECIL C. CRAIG
University of Michigan

HAROLD F. DODGE
Rutgers • The State University

A. V. FEIGENBAUM
General Electric Co.

ENOCH B. FERRELL
Bell Telephone Laboratories

FRANK E. GRUBBS
Aberdeen Proving Grounds

DAME S. HAMBY
North Carolina State College

CHARLES R. HICKS
Purdue University

HOWARD L. JONES
University of Chicago

LLOYD A. KNOWLER
State University of Iowa

GERALD J. LIEBERMAN
Stanford University

GAYLE W. MCELRATH
University of Minnesota

CARL E. NOBLE
Kimberly-Clark Corp.

MARY N. TORREY
Bell Telephone Laboratories

1960-61 Society Officers

President
J. Y. MCCLURE
Convair Div. of
General Dynamics Corp.
Fort Worth, Texas

Vice Presidents
L. S. EICHELBERGER
A. O. Smith Corp.
Milwaukee, Wis.

A. V. FEIGENBAUM
General Electric Co.
New York, N. Y.

A. B. MUNDEL
Sonotone Corp.
Elmsford, N. Y.

WARREN R. PURCELL
Raytheon Mfg. Co.
Newton, Mass.

Executive Secretary
DAVID S. CHAMBERS
University of Tennessee
Knoxville, Tenn.

Treasurer
R. L. FIASCHETTI
Ansco General Aniline &
Film Corp.
Binghamton, N. Y.

Junior Past President
C. E. FISHER
Bell Telephone Laboratories
New York, N. Y.

1960-61 Executive Directors

H. D. BIRCH
General Electric Co.
Cincinnati, Ohio

P. S. OLMSTEAD
Bell Telephone Laboratories
Whippany, N. J.

H. C. TODT
North American Aviation
Los Angeles, Calif.

I. W. SCHOENINGER
Globe Union, Inc.
Milwaukee, Wis.

A. W. WORTHAM
Texas Instruments, Inc.
Dallas, Texas

Technometrics

Technometrics is published quarterly under the joint sponsorship of ASQC and the American Standards Association, and is intended to serve the researcher in the physical and chemical sciences.

J. Stuart Hunter, *Editor-in-Chief*

MANAGEMENT COMMITTEE:
Paul S. Olmstead, *Chairman*
Irving W. Burr
J. Stuart Hunter
J. Y. McClure
Almarin Phillips
Maynard S. Renner
Harry L. Wehrly

Divisions of ASQC

Administrative Applications Division
E. T. MAGRUDER
Chesapeake Potomac
Telephone
Washington, D. C.

Aircraft & Missile Division
D. R. ARCHIBALD
Convair, A Division of General Dynamics Corp.
San Diego, Calif.

Automotive Division
J. J. RYAN
Pontiac Motor Division
General Motors Corp.
Pontiac, Mich.

Chemical Division
O. A. KRAL
Minnesota Mining &
Manufacturing Co.
St. Paul, Minn.

Electronic Division
GORDON BECKHART
Radio Corporation of America
Moorestown, N. J.

Food & Allied Industries Division
W. A. GOLOMSKI
H. J. Mayer and Sons Co.
Chicago, Ill.

Textile & Needle Trades Division
R. E. HEILAND
Lehigh University
Bethlehem, Pa.

Industrial Quality Control is published monthly by the American Society for Quality Control, Inc. Entered as second-class matter on Sept. 18, 1950. Second-class postage paid at the post office at Milwaukee, Wis., and at additional mailing offices.

Industrial Quality Control is sent to all members of the Society as one of the privileges of membership. Subscriptions from non-members are not accepted. Subscriptions for members *only* are $3.00 of the annual membership dues. Subscriptions for company, public, and university libraries are: 1 yr.—$9.00; 2 yrs.—$17.00; 3 yrs.—$25.00; 5 yrs.—$40.00. Back issues of Vols. I-X are available at $6.00 per volume including index; Vol. XI, $9.00; XII-XV, $10.00 ea. Individual copies are $1.00 each. Microfilm editions by volume are also available. The cost per volume is: I-VII, $10.00; Vol. VIII, ff., $2.00 ea.

Orders for library subscriptions, back issues, and microfilm editions should be accompanied by remittance made payable to the American Society for Quality Control, Inc. *Orders under $3.00 must be accompanied by remittance.*

Industrial Quality Control is regularly indexed in the *APPLIED SCIENCE & TECHNOLOGY INDEX* published by The H. W. Wilson Company, 950 University Avenue, New York 52, N. Y.

Neither this magazine, nor any portion of it may be copied or otherwise reproduced without written permission of the copyright owner. Requests for copyright release should be addressed to the editor, Mason E. Wescott. The statements and opinions given in the articles and papers in *Industrial Quality Control* are the views of the authors and not necessarily those of the Society.

Notification of address change should be sent to the secretary of your section and to the Executive Secretary's office. Allow approximately seven weeks for the change to become effective.

Executive Secretary and Publications office: Rm. 6185 Plankinton Bldg., 161 West Wisconsin Avenue, Milwaukee 3, Wisconsin. Society's New York Address: Rm. 949B, 463 West St., New York 14, N.Y.

Address all correspondence to American Society for Quality Control, Inc., Rm. 6185 Plankinton Bldg., 161 West Wisconsin Avenue, Milwaukee 3, Wisconsin.

Copyright 1960
American Society for Quality Control, Inc.
Printed in U.S.A. All rights reserved

INDUSTRIAL QUALITY CONTROL

Vol. XVII, No. 7 January, 1961

ARTICLES

8 **SQC vs. Intuitive Inspection**
CHESTER T. RAYMO 120; 342; 351; 352:60;70:400
Visual quality is extremely relative and decisions regarding visual characteristics are always in danger of becoming intuitive action. Decisions can be consistent within certain limits when the visual quality characteristics are related to a "standard."

10 **Critique of Vendor Quality Rating Systems**
LEROY FOLKS 351;352:70:000
The author discusses a method of vendor quality rating which is invariably mentioned as "statistically sound." The author points out some of the statistical properties of this method and discusses some practical considerations which enter into its evaluation.

12 **Quality Control in the Construction Industry**
JOSEPH J. WADDELL 120;130:60;70:300
The author is concerned with only one phase of quality control of construction materials, statistical analysis of data, and how it applies to one very important aspect of construction control: the evaluation of strength test results of concrete. This application of statistical control has been given great impetus by the American Concrete Institute.

16 **A Decentralized Team Approach to Quality and Reliability**
T. E. SMITH and A. W. WORTHAM 810:40; 60; 70:438
The author feels that quality and reliability are too closely allied to be separated; that engineering, manufacturing and quality assurance have joint responsibilities in this area, and that maximum success can be achieved only through teamwork of these functions.

DEPARTMENTS

From the President's Desk
Professionalism and the Inspector 4
Continental Classroom—Probability and Statistics 5
List of Short Courses in Quality Control 6
Our Cover 20
What's New? 20
Book Reviews 26
ASQC 15th Annual Convention and Exhibit 27
Section Briefs 32
Section Calendar 48
ASQC Announces 50
Positions Available 46, 47, 52, 53
Positions Wanted 52
Clinics, Conferences, and Courses 55
Consulting Services 56

EDITOR:

Mason E. Wescott

The Statistics Center
Rutgers • The State University
New Brunswick, N. J.

DEPARTMENT EDITORS:

W. D. Baten, Book Reviews
P. C. Clifford, T. A. Budne, Problems
Ellis R. Ott, Practical Aids
R. A. Wylie, What's New
J. M. Juran, Management's Corner
M. E. Wescott, Scrap Box
Paul A. Robert, Supervisor's Circle
Thomas M. Kearney, Section Briefs
D. S. Chambers, ASQC News

WEST COAST ADV. REP.

William F. Mills
P. O. Box 4002
North Hollywood, Calif.
TRiangle 7-5780

AMERICAN SOCIETY FOR QUALITY CONTROL, INC.

Managing Editor
George R. Foster

Administrative Secretary
William P. Youngclaus, Jr.

Office Manager
Jean Truettner

Room 6185, Plankinton Bldg. 161 West Wisconsin Avenue Milwaukee 3, Wisconsin

From the President's Desk

Professionalism And the Inspector

Are we facing up to the future as a society and as individuals?

We are in the midst of a technological evolution which is accelerating and expanding at a terrific pace. Concepts which were adequate ten years ago are already obsolete. Rapid obsolescence of product has become an important factor in our competitive economic system.

A corollary of this technological evolution is complexity. As new scientific breakthroughs occur, new design concepts are made possible and product complexity increases.

The desire to pack more function into less space has created a broad new set of problems. Miniaturization, micro miniaturization and micro-micro miniaturization, are creating new challenges for quality control men.

Metrology has blossomed into a full fledged science. The techniques, equipment, and problems involved have become more complex. The calibration of precision measurement equipment, and the traceability of the calibrated standards to the originals at the National Bureau of Standards is now a qualification for their use in many organizations. Calibration and calibration techniques are advancing to the point where high professional proficiency is a must.

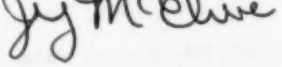
New inspection methods and techniques have been created in consonance with new scientific discoveries, to meet the inspection and testing needs brought about by converting scientific breakthroughs into saleable products. Competition, and the necessity for cost reduction, are resulting in a new generation of non-destructive test methods and equipment, sales of which are in the multimillion dollar category each year. Here again, specialized training is necessary in order to bring about proper and adequate utilization of equipment.

What does all this mean? It means that the complexity of the quality control task is increasing directly as the complexity of the product increases.

The first steps in overcoming the problems of complexity have been well taken by increasing the proportion of professional personnel to hourly personnel. What about the next step, however? What is being done to elevate the status of the inspector? What incentives are we offering the inspector to improve his personal position? How much time are we devoting to this man who constitutes a major segment of all industrial quality control functions, and of our Society?

Are we facing up to the future? We have a duty to our country, our organizations, and to ourselves to program society activities in such a manner that we provide an incentive for all of our members and potential members. There must not be a technological void between our professional and technical personnel.

I am quite happy to report that ASQC continues to accelerate its programs to benefit all categories of members. The establishment of the ASQC Institute on Education and Training, for the coordination and long range planning of training objectives and programs will be of tremendous benefit to all sections, Divisions, and Technical Committees. The growth of the Inspection Technical Committee, and related activities, as exemplified by meetings of the Inspection Division of the Los Angeles section indicate the need for, and the excellent results achieved by programs including these important members of our Society. Training programs and section level meetings serve in some manner to enlighten the inspector as well as help the professional to better understand his own problems.



Continental Classroom Presents

Probability

And

Statistics

With

PAUL C. CLIFFORD

FREDERICK MOSTELLER

ASQC Fellows

January 30 — May 26

Professor Paul C. Clifford will concentrate on classroom teaching techniques and problem solving. A Fellow and Founding Member, ASQC, Professor Clifford has served on the Editorial Board of Industrial Quality Control, the ASQC Constitution and By Laws and Applied Methodology Committee, and as chairman of the Metropolitan section. He is currently a co-editor of Problems Department, IQC; chairman of the Committee on International Cooperation; trustee of the Society's Chapter No. 1; chairman sub-committee on Management Training; a member of the Bibliography Committee, and director of the ASQC Education and Training Institute. He has lectured at Rutgers • The State University, New Brunswick, N. J., New York University, New York City, and University of Michigan, Ann Arbor, Mich. He has been a Consultant on Quality Control and QC Training since 1947, aiding industry, industrial associations, and government. He has served with UNTAA, United Nations, India, 1952; European Productivity Agency, 1954-55; European Organization for Quality Control, 1957, and the International Cooperation Administration, 1955-59.

A COURSE in probability and statistics will be presented from 6:30 to 7 a.m., Jan. 30 through May 26, Mondays through Fridays, over the NBC TV Network.

Paul C. Clifford, director of the ASQC Education and Training Institute, arranged for the course in cooperation with Dr. Frederick Mosteller, Harvard University. Mr. Clifford is a professor at Montclair State Teachers' College, Montclair, N.J.

The course will focus on the mathematical theory and applications of this theory to statistical inference. The suggested prerequisite is three years of high school mathematics, including a second course in algebra. It will include counting methods, sets, distributions of random variables, normal distribution, binomial distributions, central limit theorem, sampling theory, confidence limits, hypothesis testing, use of prior information, and sums of independent random variables.

The course is one of three in the Contemporary Mathematics series on Continental Classroom. The other courses are Modern Algebra and Modern Chemistry.

Undergraduate, Graduate Credit

Colleges and universities will individually determine the amount of credit to be given, but three semester hours credit is recommended for both the undergraduate and graduate courses.

Last year, 158 stations telecast Continental Classroom. With few exceptions, the courses will be telecast by NBC stations which are located near participating colleges. In areas not covered by an NBC station, Continental Classroom can frequently arrange for telecasts by a station serving that area.

The course will be telecast from 6:30 to 7 a.m., in each time zone. Certain ETV stations in the Mountain Time Zone may carry the courses on a delayed basis.

The majority of colleges and universities arrange for weekly or bi-weekly meetings. At these meetings, the local coordinator or teacher discusses and reviews material presented on the telecasts, answers questions, clarifies concepts, presents supplementary materials, makes assignments, administers tests, etc.

Some universities will offer the mathematics courses through their correspondence divisions.

Each college will have complete autonomy regarding tuition, and each will determine the appropriate procedures for grading. Colleges report that the grade pattern for Continental Classroom courses has been comparable to that in similar courses offered by the colleges.

Textbooks and General References

Course textbooks are:

Probability and Statistics, Mosteller, Rourke, and Thomas, Addison-Wesley Publishing Co., Reading, Mass., 1961, and *TV Lesson Schedule* (25 cents, postpaid), Learning Resources Institute, 680 Fifth Ave., New York 19, N.Y.

General references for the course are:

College Entrance Examination Board, *Introductory Probability and Statistical Inference*, Gray Book, New York, 1959

S. Goldberg, *Probability — An Introduction*, Prentice-Hall, Englewood Cliffs, N.J., 1960

W. A. Wallis and H. V. Roberts, *Statistics — A New Approach*, The Free Press, Glencoe, Ill., 1956

S. S. Wilks, *Elementary Statistical Analysis*, Princeton University Press, Princeton, N.J., 1949

The course is being sponsored by the Conference Board of the Mathematical Sciences, Learning Resources Institute, and NBC.

Course Contributors are the Bell Telephone System, E. I. duPont de Nemours & Co., the Ford Foundation, General Foods Fund, IBM Corp., RCA, Union Carbide Corp., and United States Steel.

For additional information, contact Dr. John J. Kelley, National Coordinator, Continental Classroom, 680 Fifth Ave., New York 19, N.Y.

CHAPTER ONE — Probability and Statistics

This lesson schedule indicates briefly the topics to be covered in each lesson. An additional paragraph usually gives reasons for the inclusion of the material and points out the relationship to the other lessons.

LESSON 1, Jan. 30 — Probability and Statistics. Advice to viewers. Brief outline of course. Relation of this course to that on the Teaching of Probability and Statistics. Interpretations of probability: objective and personalistic approaches. Some applications of statistics.

LESSON 2, Feb. 1 — Empirical study of variability. Some experiments: number of cards to first ace, length of words, phone numbers, random walk.

Probability and statistics deal with the fluctuations and the regularities in processes that contain elements of chance. Better personal experience of probability processes can be acquired by doing a few experiments of a simple sort, keeping records of the results, and analyzing them, paying particular attention to the amount of variability inherent in various types of experiments.

CHAPTER TWO — Permutations, Combinations, and the Binomial Theorem

Many problems of a probabilistic nature require us to determine the number of ways in which a task can be performed. The counting process involved in the solution of such a problem can often be simplified with the help of the mathematical principles and tools that we study in Chapter Two.

LESSON 3, Feb. 3 — Counting. The addition and multiplication principles as aids in the solution of counting problems. Permutations as ordered arrangements. Tree diagrams. How many different license plates are there? How may pizza toppings? How many flag signals?

We state two general principles that are basic for counting all possible selections of objects and all possible ways of executing several operations including ordered arrangements of items.

LESSON 4, Feb. 6 — Counting arrangements of objects: formulas for permutations. The factorial symbol. The number of permutations of n different objects taken r at a time, when r is equal to or less than n. Anagrams. The elevator problem.

The number of ordered arrangements of selections from a set of objects is easily obtained with the help of formulas for the number of permutations. The groundwork is laid for Lesson 5.

LESSON 5, Feb. 8 — Combinations. Combinations as selections. The number of combinations of n different objects taken r at a time. Bridge hands. Pascal's Rule. Pascal's Triangle: building step by step.

If the counting process is concerned with selections from a set of objects, we have a problem of **combinations.** The formula obtained is a key point in our development of the binominal theorem.

LESSON 6, Feb. 10 — Permutation of things that are not all different. The formula for the number of permutations of n objects if not all n objects are different. Anagrams of fluff, acacia, and Mississippi. The equivalence between permutations of n objects of two kinds and combinations of n objects, all different.

LESSON 7, Feb. 13 — The binomial theorem. The expansion of binomial expressions of the type $(a + x)^n$ for positive integral n. Applications involving the approximate evaluation of certain powers and roots.

Binomial expansions underlie a widely applied probabilistic model that we study in Chapter Seven.

CHAPTER THREE — A First Look at Probability: Equally Likely Outcomes

This chapter presents an intuitive approach to probability. Using experiments with equally likely outcomes, we introduce and discuss basic concepts. A more formal approach follows in Chapter Four.

LESSON 8, Feb. 15 — A first look at probability. Some intuitive ideas. Equally likely cases. Coins, dice, and cards. The idea of a random sample. An example from genetics. Probability and odds.

Elementary experiments involving chance lead to a first definition of probability, appropriate when outcomes are equally likely. The lesson presents physical reasons that justify the assumption of equally likely outcomes, and circumstances under which this simple model is useful.

LESSON 9, Feb. 17 — Collection of objects: sets. Basic ideas and some vocabulary pertaining to sets. The roster and rule

Short Courses in Quality Control

Usual Time Course is Held	*Type of Course*	*Where Held*	*Course Director*
Jan. 30-Feb. 9	Basic	University of Illinois, Urbana, Ill.	John A. Henry
Apr. 23.-May 5	Advanced	University of Connecticut, Storrs, Conn.	Richard M. Story, Jr.
May 19-26	Basic (Textile Ind)	North Carolina State College, Raleigh, N.C.	David B. Stansel
June 5-9	Basic (Graphic Arts)	Rochester Institute of Technology, Rochester, N.Y.	Harold Kentner
June 7-17	Design of Experiments	Purdue University, Lafayette, Ind.	Charles R. Hicks
June 11-23	Reliability Institute	University of Connecticut, Storrs, Conn.	Richard M. Story, Jr.
June 12-21	Basic (Chem. Ind)	Rochester Institute of Technology, Rochester, N.Y.	Harold Kentner
June 22-29	Advanced (Chem. Ind.)	Rochester Institute of Technology, Rochester, N.Y.	Harold Kentner
July	Basic	TAPPI Statistics Course, Queens University, Kingston, Ontario, Canada	.....
July	Advanced	TAPPI Statistics Course, Queens University, Kingston, Ontario, Canada	.....
July 31-Aug. 11	Statistical Methods In Industry	UCLA, Los Angeles, Calif.	Edward P. Coleman
August 21-31	Basic	University of Michigan, Ann Arbor, Mich.	C. C. Craig
September 5-15	Advanced	Purdue University, Lafayette, Ind.	Irving W. Burr
September 10-22	Basic	University of Connecticut, Storrs, Conn.	Richard M. Story, Jr.

Professor Frederick Mosteller, a Fellow, ASQC, has been associate editor or collaborating editor of Annals of Mathematical Statistics, Journal of the American Statistical Association, Psychometrika, Industrial Quality Control, Psychosomatic Medicine, Sociometry, Psychological Review, and American Statistician. He has been a member of council and board of directors of the American Statistical Association, Council of the Institute of Mathematical Statistics, Board of Directors of the Social Science Research Council, Commission on Mathematics of the College Entrance Examination Board, Committee on the Undergraduate Program of the Mathematical Association of America, and Committee on the Mathematical Training of Social Scientists of the Social Science Research Council. He has been president of Psychometric Society, 1957-58, and president of the Boston Chapter of the ASA, 1959-60. He has taught at Harvard, Princeton, and Carnegie Institute of Technology.

methods of specifying sets. Inequalities and absolute values: useful symbols in the specification of sets. The universal set and its subsets.

The notion of a set is basic for our study of probability. The lesson reviews elementary ideas about sets, the manipulation of inequalities and the use of absolute values to measure distance and specify intervals.

LESSON 10, Feb. 20—Finite sample spaces and their probabilities. A sample space as a mathematical representation of an experiment. The computation of probabilities of events in sample spaces for experiments with equally likely outcomes. Two-dice problems. A sampling problem.

We apply the terminology of sets to the formulation and solution of probabilistic problems. Our work on counting begins to pay off.

LESSON 11, Feb. 23 — Operations with sets and events. Three basic operations: intersection, union, and complementation. The meaning of the word **or** in mathematics.

The more interesting problems in probability involve combinations of several elementary events. We discuss ways of combining two (or more) events.

LESSON 12, Feb. 27 — Mutually exclusive events. The probability of the union of two and of three arbitrary events. The probability of the union of two or more mutually exclusive events. Partitions of the sample space. Probabilities of complementary events. Applications to simple games of chance.

The formulas of this lesson enable us to compute the probabilities of events that are composed of several events.

LESSON 13, Mar. 1 — Introduction to independent events. Intuition and independence. The technical meaning of independence in probability. Independence of dice. Independent versus mutually exclusive events. Random walk with one absorbing barrier.

Experience and intuition often tell us that two events "have nothing to do with one another." The concept of independence is the probabilistic formulation of this nontechnical description. The wide applicability of the assumption and the resulting simplicity in the computation of probabilities make independence a key concept. The random walk problem has a variety of practical applications: queueing theory, information processing, birth and death process, and gambler's ruin.

LESSON 14, Mar. 3 — Introduction to conditional probability. Probabilities subject to supplementary conditions. Conditional probabilities as probabilities in reduced sample spaces. A formula for conditional probabilities. Conditional probability and independent events. Discussion of a fallible test for a disease.

The problem of conditional probability arises when the conditions which specify the original sample space are supplemented by additional information. The new information may change the probability of events, and the adjusted probability is called a conditional probability. Conditional probabilities can be computed wth the help of a formula or by direct computation in an appropriately reduced sample space. The idea of conditional probability throws important light on the concept of independence.

LESSON 15, Mar. 6 — Sample spaces with many elements. The use of formulas for the number of permutations and combinations in the solution of probability problems. The first-ace and birthday problems. Probabilities for two-by-two tables (hypergeometric distribution).

We discuss some problems in probability whose solutions make full use of the counting devices developed in Chapter Two. The first-ace problem is a model for a search for a rare object — the needle in the haystack. The surprising numerical results in the birthday problem illustrate that intuition is not always a good guide. The birthday problem offers a special theory for coincidences. The two-by-two table problem has extensive applications in many areas of statistics — to sampling without replacement from a finite population composed of two kinds of elements, to the study of association between attributes (fair-haired and blue-eyed, for example), and to the comparison of proportions having a given attribute in two different groups.

LESSON 16, Mar. 8 — The Monte-Carlo method. Random drawings. Use of random devices in the design of scientific experiments and in the solution of probabilistic as well as nonprobabilistic problems. Random numbers. Use of tables of random digits. Generating events with prescribed probabilities. Selecting a random sample from a listing.

Often scientific and other experiments can be properly evaluated only if they are designed so that the various possible outcomes of the experiment occur according to prescribed probabilities. Monte-Carlo methods can often be used to insure that a probabilistic and/or statistical interpretation of the experiment is valid. Today, many difficult mathematical and physical problems are solved by carrying out large scale experiments based on random numbers generated by high-speed computers.

Chapters 5 and 6, Lessons 17-33, Mar. 24-Apr. 21, will be published in the February issue, Industrial Quality Control.

Chapters 7 through 9, Lessons 34-48, Apr. 24-May 26, will appear in the March issue.

Norbert Wiener to Head Symposium At Purdue University April 12-13

Norbert Wiener will head a group of speakers at the third Symposium on Information and Decision Processes at Purdue University Apr. 12-13.

Speakers will include Richard Bellman, Rand Corp., discoverer of the new tool of dynamic programming; Tjalling C. Koopmans, one of the founders of linear programming; Howard Raiffa, coauthor with R. D. Luce of the recent book, "Games and Decisions"; L. J. Savage, University of Michigan, best known for his book, "The Foundations of Statistics."

The two previous symposia have been well attended by representatives of electronic industries, defense industries, the armed services and universities. Out of these events came the recent book, "Information and Decision Processes," edited by Robert A. Machol, chairman of the forthcoming symposium.

During the current program, a new group of eight speakers will present a sampling of mathematical approaches which may be employed in the making of optimal decisions in exceedingly complex situations. The speakers are some of the most brilliant men in the field.

The program will be of particular interest to those concerned with information theory, decision theory and mathematical statistics as well as those interested in operations research, systems engineering and related fields, according to Dr. Machol. He anticipates that members of the audience will have some familiarity with the calculus and with the elements of probability theory, and says that a greater degree of mathematical sophistication will aid in understanding some of the talks.

For additional information, contact Dr. Robert E. Machol, School of Electrical Engineering, Purdue University, Lafayette, Ind.

SQC vs. INTUITIVE INSPECTION

CHESTER T. RAYMO

American Lava Corp., Chattanooga, Tenn.

Subsidiary of Minnesota Mining & Mfg. Co.

"There is nothing more frightful than ignorance in action"—Goethe

QUALITY CHARACTERISTICS involving measurements by variables can be defined in most cases. Visual characteristics are difficult to define and adhere to because of the differences in human concepts and evaluations. Visual quality therefore is extremely relative and decisions regarding visual characteristics are always in danger of becoming intuitive action. In many cases of judging visual quality, it is common to see what we want to see, and no more. All quality is relative, but decisions *can* be consistent within certain limits when the visual quality characteristics are related to a "standard". Finding and establishing this standard is not an easy job. It requires good communications between producer and consumer on quality, but good producer-consumer relations are too often hampered by red tape and chains of authority. Quality characteristics must nevertheless be specified and standardized because "a quality specification is a means for securing a meeting of the minds."

When specifications are absent or loosely defined, the various functions of a business tend to issue arbitrary and authoritative decisions on quality. This unfortunately encourages an autonomous functional organization, wanting in a cooperative effort, to make a quality product. Quality today comes only through a joint effort of all business functions. The inspector today measures the product to aid the production rate and to measure conformance to engineering specifications. The day of craftsmanship and functional autonomy has almost vanished in favor of total productivity. Total productivity is the combined effort of an entire well-knit organization producing at a profit while giving customer satisfaction in quality, price, and delivery.

The customer becomes dissatisfied with poor quality and delivery when the various functions in the vendor's plant do not agree as to the best approach to the quality function; and the vendor finds himself out of line on price because of excessive losses and spoilage resulting from different points of view of design, production, and inspection. The designer too often expects production to have ideal conditions for manufacturing a product. Ideal conditions are rarely, if ever, the case. Production frequently asks for more tolerance to protect itself from the numerous problems associated with men, machines, and materials. Inspection is caught in a maelstrom of confused prestige between design and production and gives in to intuition when standards are not clear.

The designer is responsible for specifications, but too often he is so far away from the actual conditions that he is forced to trial and error, or intuitive methods. In some cases the designer actually depends on production and inspection to correct errors or miscalculations in specifications!

The designer must be constantly informed of manufacturing changes and inspection techniques in order

ASQC LCS Codes 120; 342; 351; 352:80;70:400

to avoid professional pitfalls involving quality. How many designers today know what the term "process capability" means? Do they understand it as the *actual process variability*? Or are they inclined to stick to intuition rather than accept a term not born of their own profession?

The designer today must also consider the customer's quality requirements by knowing more about the end use of a product. He must recognize production quality problems by asking for, and relying on, process capability studies. He must not expect inspection to measure to unrealistic tolerances with inadequate equipment. Inspection represents the customer and decisions on quality cannot be favorable to the customer without good specifications and good inspection tools.

If the proper unit of measurement is defined and tools of measurement provided, reliable decisions as to conformance can be attained. In addition to knowing what to measure, the unit of measurement, and how to measure, it is necessary to record the measurements systematically.

Two Basic Methods

A process can be measured and controlled by two basic methods. One method is by *attributes*, which means that the characteristic, or item, is either good or bad. The other method is by *variables*, which means that a quality characteristic of an item is measured with an appropriate instrument to determine the degree of variation about a given value.

Most industrial processes produce items with measurable quality characteristics. A quality characteristic can be a dimension, a weight, an electrical or chemical property. *Any quality characteristic measured with an appropriate unit of measurement can be controlled.* If measured values of a characteristic in a controlled process are tallied as a frequency distribution, the pattern will resemble a normal curve. This concept is true *if an appropriate unit of measurement is selected.*

The unit of measurement, and, of course, the instrument of measurement, can be determined by the tolerance required for the characteristic measured. As a general rule, the unit of measurement should be at least one tenth of the total tolerance required and can be as small as one twentieth of the tolerance. If the tolerance is $\pm 0.001''$, measurements should be in ten thousandths ($0.0001''$). There needs to be a general revolution in industry and educational institutions to this simple concept.

The unit of measurement can also be determined by trial and error. The trial and error method is recommended when tolerances are liberal or when an instrument is more precise than is necessary for control work. When using the trial and error method, it is necessary to recognize an accepted practice of measuring at least 25 items and not more than 50 items taken at random from lots of *any* size in a manufacturing process. The unit of measurement is then determined by trial and error until the pattern of the measured values resembles a *normal curve.*

The manufacturer and the consumer must agree at the time of purchase on clear, concise, and realistic specification. Unless this is done, the problem of producing a satisfactory product is obviously difficult. The customer invariably wants his purchased part to conform to his print and/or specifications. But in most cases his specifications are drawn up with very little knowledge of the manufacturer's process facilities and capabilities. The manufacturer, therefore, has a very serious obligation to inform or educate the consumer as to what he can expect in the way of conformance to the desired specifications. The consumer also has the obligation to inform the manufacturer of what will be considered a defective item—that is, how will a purchased item be judged good or bad. Generally when a specification is exceeded, an item becomes a defective.

A product should no longer be purchased to a "standard" tolerance like plus or minus one percent or two percent of the print dimensions. The end use of a product naturally requires that some characteristics be more precise than others. The manufacturer is in a better position to serve the customer if each quality characteristic is adequately defined as to appearance, dimensions, and physical or chemical requirements.

An item can have a defect, especially visual, but which is not serious enough to cause a defective item. For this reason it is important to put limitations on the degree to which a defect can be tolerated. For instance, 'pits not larger than 1/32" and no more than three pits to an item' would be a typical limitation for a cavity defect. When these limitations placed on the visual defects are exceeded, the item *then* becomes a defective and intuitive decisions are minimized. Visual standards are sometimes provided for comparison in deciding what is good or bad. When standards are used in this manner they serve to define or show the limits within which the visual defect must fall.

Acceptable Quality Level

Since there are only rare cases where "perfect" items are made, both the vendor and consumer must recognize that there will be some defects and some defectives in many lots produced. It becomes important, then, that vendor and consumer agree on an acceptable amount of defects and/or defectives which will be permitted in a lot, or a group of lots. When this is done, an Acceptable Quality Level is established. This level of defectiveness is known as the AQL value for the particular product, or quality characteristic.

Once the specifications on quality characteristics have been established, the vendor and consumer must agree on the *quality level commensurate with the product price.* For instance, the vendor may produce lots of material with two percent defective items much cheaper than he could produce lots with fewer defectives, yet the consumer would rather pay the lower price with two percent defectives than pay the higher price with fewer defectives.

The quality level the consumer generally will buy is defined as Acceptable Quality Level (AQL). AQL values can be applied to a product on a *cumulative* basis for *any* quality characteristic which would classify an item as a defective. In this case the *lot* would become defective when the number of defective items exceeds the AQL sampling requirements for *lot* defectiveness agreed upon. AQL values can also be assigned to permit defectives to accumulate for *each* quality characteristic. As long as none of these quality characteristic AQL values were exceeded, the *lot* would be acceptable. Exceeding any

one of these AQL values for individual characteristics would reject the *lot*.

A manufacturing blueprint of only dimensional requirements can no longer suffice for the intelligent production of a quality product. Even the method of arriving at dimensional tolerances has been revolutionized by SQC. The tolerances must be in line with the producer's process capabilities. The relative importance of each dimension must be indicated with an appropriate quality level. Visual, chemical, and physical characteristics must all be specifically defined and have the desirable quality level indicated. Regardless of the quality characteristic defined there will be a relationship between the consumer's specification limits for that characteristic and the producer's process capability limits. All of these considerations minimize intuitive decisions.

SQC vs. Intuitive Inspection

Intuitive Inspection is always accompanied by Traditional Tolerances, Draftsmen's Dreams, Designers' Delusions, Production Practices, Engineering Enigmas, and Inspection Intolerances!

Examples of SQC vs. Intuitive Inspection will show the superiority of SQC:

S. Q. C.	*Intuitive Inspection*
Realistic specifications	Little or no specifications
Process capability studies	Personal opinion of what process can do
Adequate tools of measurement	Approximate means of measurement
Practical unit of measurement	Unit seldom defined
Collection of data	No records
Analysis of data	No predictions
Realistic quality decisions	Personal opinion of quality

SQC seeks to prevent defectives; inspection measures degree of conformance. Measurements without records are mere memories. SQC charts from measurements are pictures and visual comparisons for corrective action. An Average-Range chart is past, present, and future, whereas the Go—No Go method is for the past since it cannot be used to view the present or foresee the future. SQC, as a method of investigation and control, is ultimately accepted by primitive practitioners of industrial control after all their intuitive methods fail!

Inspection through quality control is no longer "non-productive", because with the inspector's tools of today — graph paper and pencil — defectives are prevented. When defects are prevented, productivity is increased, losses decrease, and the possibility of defective products reaching the customer is greatly reduced. Methods are also improved by analysis of the charted measurements. Realistic tolerances can be established by process capability studies of the graph paper records. Such tolerances are more reliable than those established by past practice, cut-and-try, or bargaining.

SQC is the employment of the scientific method and the use of all staff functions for a coordinated quality effort. With Intuitive Inspection still prevailing in many industries today, there is an obvious challenge for management to exploit SQC methods as a direct route to larger profits and greater customer satisfaction.

"Quality is never an accident. It is always the result of intelligent effort. There must be a will to produce a superior thing"—John Ruskin

Critique of Vendor Quality Rating Systems

LEROY FOLKS

Texas Instruments Inc., Dallas, Texas

Introduction

In recent years a number of methods have been put forward for the rating of vendor quality. One of the most publicized of these methods, invariably mentioned as "statistically sound," is discussed in this article. It is the purpose of this article to point out some of the statistical properties of this method and to discuss some practical considerations which enter into its evaluation.

Notation

Suppose that a vendor is supplying lots of size N to a customer. The customer takes a sample of size n from each lot and inspects the sample. In addition let

K = Number of lots submitted
c = Number of defectives in the sample
p = Fraction defective in the sample
P = Fraction defective in the lot
p' = AQL expressed in fraction defective
$f(P)$ = Probability density function of P. This gives the distribution of the fraction defective of lots from the vendor
μ = Process average—average lot fraction defective of the process
σ^2 = Process variance—variance of the lot fraction defective.

Statistical Properties of the Rating Method

A rating is computed for each lot and the lot ratings are combined to give a vendor rating. We shall use x to denote a lot rating and y to denote a vendor rating. Of widespread usage (see References) are the following formulas:

$$\text{Lot rating} \quad x = k_1 - \frac{k_2\sqrt{n}(p - p')}{\sqrt{p'(1 - p')}}$$

$$\text{Vendor rating} \quad y = k_1 + \sqrt{K}\,\frac{\sum_{1}^{K} x}{K - k_1}$$

where k_1 and k_2 are arbitrarily chosen constants. They are generally chosen so that k_1 is to represent an average rating and so that $k_1 + 3k_2$ is in the neighborhood of 100. For example, let

$$k_1 = 75 \qquad k_2 = 7.5$$

Then

$$x = 75 - \frac{7.5\sqrt{n}(p - p')}{\sqrt{p'(1 - p')}}$$

If

$$p = p' \quad x = 75$$
$$p > p' \quad x < 75$$
$$p < p' \quad x > 75.$$

Consider the moments of x and y over all possible

ASQC LCS Codes 351;352:70:000

samples from all possible lots from the process. It can be shown that:

$$(1) \qquad E(x) = k_1 - \frac{k_2\sqrt{n}(\mu - p')}{\sqrt{p'(1-p')}}$$

$$(2) \qquad \sigma_x^2 = \frac{k_2^2 n}{p'(1-p')}\left[\frac{N-n}{N-1}\,\frac{\mu - \mu^2 - \sigma^2}{n} + \sigma^2\right]$$

For N large, the binomial approximation holds and

$$(3) \qquad \sigma_x^2 \approx \frac{k_2^2}{p'(1-p')}\,[\mu - \mu^2 + \sigma^2(n-1)].$$

For small P and large n and N, the Poisson approximation leads to

$$(4) \qquad \sigma_x^2 \approx \frac{k_2^2}{p'(1-p')}\,[\mu + n\sigma^2].$$

In any case $E(x)$ is a function of n, the departure of $E(x)$ from k_1 being an increasing function of n, the sample size. This contradicts the claims that x provides a measure of quality independent of sample size. For the binomial and Poisson cases, the variance of x is an increasing function of n, the sample size. It can also be shown that the σ_x^2 for the hypergeometric case as given in (2) is an increasing function of n for all reasonable values of μ and σ^2. Thus not only the average of x, but the precision is affected by the sample size, contrary to claims.
It can also be shown that

$$(5) \qquad E(y) = k_1 + \sqrt{K}\,[E(x) - k_1]$$

$$(6) \qquad \sigma_y^2 = \sigma_x^2$$

Thus the departure of $E(y)$ from k_1 is an increasing function of n and K, and the sample size affects σ_y^2 in the same way that it affects σ_x^2.

Evaluation of the Rating Method

a. From equations (1) and (5) it is seen that the average lot rating and the average vendor rating are functions of the process average but not of the process variability. Consider two processes with the distribution of fraction defective in lots given by the curves in Fig. 1.

Although process 1 is more variable than process 2, we would expect the same average lot and vendor rating from the two processes. This is clearly undesirable. A rating method should reflect the variability as well as the average of the process.

b. Since $E(x)$ is a function of n, the lot rating is a measure not only of quality but of the sample size. Suppose that a vendor's process average were greater than the AQL. Then he would expect a lower rating for large samples than for small samples. Analogous comments hold for $E(y)$ as a function of sample size and the number of lots submitted.

c. Contrary to all intuitive notions that a larger sample size should lead to increased precision, the variance of x increases as n increases. This means that we can expect greater fluctuation in lot ratings with large samples than with small samples. It is also interesting to note that a large K does not lead to increased precision in y because of equation (6).

d. In certain instances physical considerations place an upper bound well short of 100 but no lower bound. In a certain application of this method, reduced inspection is started when three consecutive lots score a rating of 80 or better. This particular application uses

$$k_1 = 70 \text{ and } k_2 = 5.$$

That is

$$x = 70 - \frac{5\sqrt{n}(p - p')}{\sqrt{p'(1-p')}}$$

Consider an AQL of $p' = 0.01$. The best possible rating occurs when $p = 0$ and gives

$$x = 70 - \frac{5\sqrt{n}(-0.01)}{\sqrt{(0.01)(0.99)}} \approx 70 + 0.5\sqrt{n}$$

In order to get a rating of 80 or more (even with no defects) the sample size would have to exceed 400. This is clearly an intolerable situation. A rating of 100 in this case would require a sample size of 3600 or more. Lots smaller than 400 would automatically receive a rating below 80.

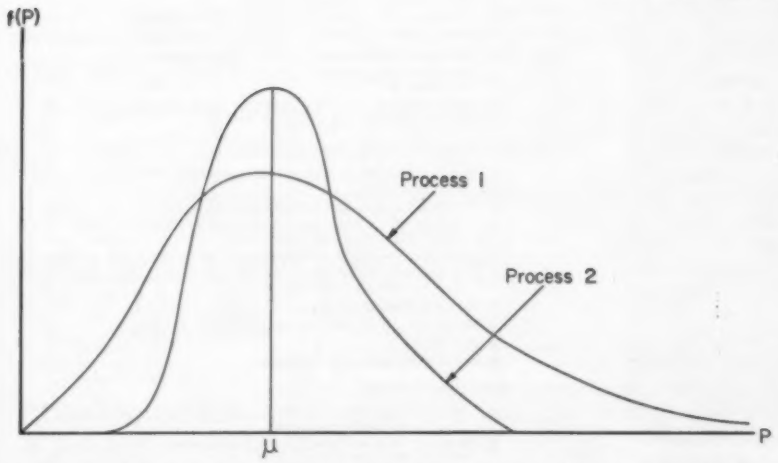


Figure 1 — Possible Process Distribution Curves for Fraction Defective in Submitted Lots

Summary

Although the vendor rating method discussed here may be "statistically sound" from some points of view, it possesses some very undesirable statistical properties. It is doubtful that there is any one measure of vendor quality which would be completely satisfactory, but any method should certainly be free of these shortcomings.

References

1. Fitzgibbons, Robert G., "The Bendix Radio Vendor Quality Rating System," *Industrial Quality Control*, Vol. XI, No. 8, May, 1955, p. 38.
2. Georgis, George C., "An Application of the Bendix Vendor Quality Rating System to a Small Plant," *Industrial Quality Control*, Vol. XIII, No. 9, March, 1957, p. 12.
3. Pappas, Robert L., "The Ampex Quality Rating System," *Industrial Quality Control*, Vol. XIII, No. 9, March, 1957, p. 9.
4. Schneider, John, "A Vendor Quality Conformance Procedure," *Industrial Quality Control*, Vol. XV, No. 3, September, 1958, p. 10.

Quality Control in the Construction Industry

JOSEPH J. WADDELL

Introduction

During the past several years, there has been a determined effort on the part of many engineers to improve the quality of construction by directing more attention to proper selection and use of materials. More and more engineers realize the importance of this and are applying the principles of quality control to design and construction by incorporating the requirements for such control in specifications and by insisting that the finished product be constructed in conformance with these requirements.

Quality control of materials is a relatively old concept as applied to products manufactured at a permanently located factory or mill. In the construction industry, typical examples are control of the manufacture of steel and cement. For these and other such manufactured products, quality control and proper use of materials are essential to insure that the finished product will conform to established standards.

All too frequently, construction materials do not receive the same quality control so essential to insure a finished high-quality product expected and paid for by the owner. For example, the quality of concrete may suffer partly due to the fact that concrete is generally mixed "on the site" using local aggregates most economically available. Also, batching and mixing plants, being of a portable or semi-portable design, are less susceptible to the built-in features that contribute to quality control usually found in permanently located plants or factories.

Present Applications

In the construction industry, quality control is thought of as a system by which materials are evaluated and controlled by scientific methods rather than by chance. Scientific methods of investigating, testing and analyzing provide criteria by which materials are evaluated and used in construction. Specifications for materials, methods of test, and standards of acceptance are established from these criteria. Use is made of standards and test methods established by leading scientific and engineering societies, adapting them to the particular usage contemplated. With realistic standards designed for each specific job, adequate and unbiased inspection, and statistical methods of analysis, best use can be made of available materials.

Three general classes of activity comprise quality control of construction materials, as shown in Table I.

This article is concerned with only one phase of this control, statistical analysis of data, and how it applies to one very important aspect of construction control: the evaluation of strength test results of concrete. This application of statistical control has been given great impetus by the American Concrete Institute.[1]

ASQC LCS Codes 120:130:90:70:300

Joseph J. Waddell is chief materials engineer, Knoerle, Graef, Bender & Associates, Inc., Consulting Engineers, Chicago, Ill.

The Strength of Concrete

In general, strength is a good index of concrete quality, as most desirable properties are dependent on or related to strength. Strength is usually determined by means of 6-by-12-inch cylinders, made at the time the concrete is placed, and tested in compression at various ages. One might say that the primary function of these compression tests is to serve as a measure of the uniformity and quality of concrete.

The magnitude of variations in strength of concrete test specimens depends upon how well the materials, concrete manufacture, and tests are controlled. Differences in strength can be traced to two fundamentally different sources as shown in Table II: either real differences in strength-producing properties of the concrete mixture, or apparent differences in strength caused by discrepancies in tests.

To obtain maximum information, a sufficient number of tests should be made to be representative of the concrete produced, and appropriate statistical methods should be used to interpret the results. Statistical methods provide the best basis for analyzing these results for determining potential quality and

TABLE 1 — Quality Control of Construction Materials

A. Preliminary Investigations
   1. Preparation of Specifications.
   2. Adaptation of standard methods of testing.
   3. Establishment of standards for acceptance and control.
   4. Development of special test procedures.
   5. Investigation, evaluation and establishment of sources of supply.
   6. Arrangement for both off-site and on-site inspection.
   7. Preparation of manuals.

B. Construction Inspection and Control
   1. Study of service records of materials or combinations of materials.
   2. Inspection and testing of materials.
   3. Evaluation of test results and determination of suitability of materials.
   4. Decision relative to disposition of borderline materials.
   5. Control of materials made at the site, such as concrete and bituminous mixtures.
   6. Training of testing and control personnel.
   7. Supervision of testing and control personnel.
   8. Reports.
   9. Statistical analysis of data.

C. Special problems
   1. Trouble shooting for architects and engineers, producers or manufacturers.
   2. Consultation on special problems concerning construction materials.
   3. Research and development of new methods and equipment.

Figure 1—An inspector is shown making 6 by 12 inch concrete specimens. He is using a small vibrator immersed into the concrete in the mold to consolidate the first layer

strength of concrete in a structure and expressing results in the most useful form.

Concrete strength test results fall into the familiar pattern of the normal frequency distribution curve. For example, on the Northern Illinois Toll Highway, the frequency distribution for over 10,000 test cylinders made during paving operations is shown in Fig. 3. Smaller numbers of specimens follow the same general pattern.

Control of the strength of concrete introduces many problems. Most present-day specifications set forth a minimum strength which *all* specimens are required to exceed. This is an unrealistic requirement because the likelihood is that no absolute strength requirement will be met 100 percent of the time.

From the foregoing, one can see the futility of specifying that "the concrete shall have a minimum strength of X psi." If all of the cylinders reported from a job reached or exceeded the specified minimum, it would indicate that either the average strength was unnecessarily high, or that the low ones were thrown out as being "non-representative." In either case, an unsatisfactory condition exists which calls for corrective action. One of the first steps is a realistic approach to specifying strength. Knowing that concrete is a variable material, the only realistic approach is to recognize that some cylinders are going to show unusually high strengths and some will show unusually low strengths.

In designing specifications then, it is more realistic to take a calculated risk, basing the probabilities on statistical methods and permitting a certain percentage of strength tests lower than specified design strength. These variations exist, and a certain percentage of low strengths exist, depending on the average strength level and the quality of control. Recognizing this basic fact does not jeopardize construction quality. On the contrary, it gives the engineer a tool which permits him to hold to a standard that can be attained.

TABLE II — Principal Sources of Strength Variations

Variations in Concrete Properties	Discrepancies in Testing Methods
Changes in water-cement ratio: Variations in aggregate water content Poor control of water added.	Inconsistent sampling procedures
Variation in water requirement: Non-uniform materials Temperature variations.	Non-uniform fabrications of specimens: Improper or excessive handling of sample.
Variations in characteristics and proportion of materials: Cement Aggregates Admixtures	Amount of consolidation. Care of fresh specimens. Curing variables: Temperature variations. Moisture variations.
Variations in transporting, placing and consolidation.	Improper testing procedures: Capping specimens. Testing machine operation.
Variations in temperature and curing.	

Adapted from ACI Journal, July, 1957[1]

Analysis of Strength Variables

For example, assume that a paving concrete is required to develop a strength of 4,000 psi at age of 28 days. Table III shows average strength required which will probably enable the operation to meet the quality level shown above each column, for the variation coefficients shown.

The coefficient of variation ($\sigma/\overline{X}$) expresses the degree of dispersion on a percentage basis, thus providing a numerical measure of variability of control, a smaller coefficient indicating better uniformity. In field work of this type, the coefficient usually ranges between 10 and 15 percent; occasionally it will be as high as 20 percent, and rarely as low as 5 percent. These generalizations assume a sufficiently large number of tests to constitute a representative sample of total concrete placed.

Looking at Table III, strengths in the column headed "1 in 200" show how unrealistic it is to specify an absolute minimum strength. Even though there is an allowance of ½ of 1 percent below 4000 psi, a job under fairly good control, with a coefficient of 15 percent, would require an average strength of 6500 psi. With a variation coefficient of 25 percent,

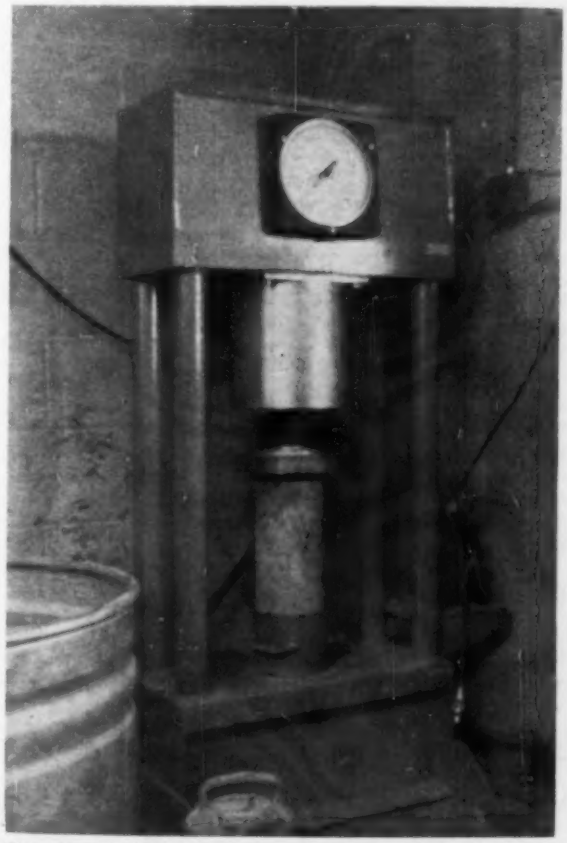


Figure 2—6 by 12 inch concrete specimen in position for testing in a 300,000 lb. capacity compression testing machine

TABLE III — Required Average Compressive Strength at 28-days for 4,000 psi Concrete

$\sigma/\bar{X}$ Coefficient of Variation (Percent)	Proportion Below Specified Strength		
	1 in 5	1 in 10	1 in 200
5	4,200	4,300	4,600
10	4,400	4,600	5,400
15	4,600	5,000	6,500
20	4,800	5,400	8,300
25	5,100	5,900	11,200

the strength requirement is virtually impossible of attainment.

A strength of 4000 psi, as used in this example, is usually specified for pavement concrete. Strength failures in this type of construction are not too serious, and an allowance of one in five below design strength may be permitted. Again using a coefficient of 15 percent, it is seen that required average strength is 4600 psi, which is not difficult to attain. Even with poor control, the required average is easily within reach, although it will be more expensive, requiring additional cement (the most expensive ingredient in concrete).

Strength Specifications

Based on analyses similar to the foregoing, specifications for the Northern Illinois Toll Highway were set up to make use of statistical analyses of strength results at regular intervals. These specifications provided the following controls as applied to pavement concrete. Similar controls were applied also to two grades of structural concrete and one high-strength concrete for prestressing.

"Compressive strength shall be determined on the basis of 6- x 12-in. cylinders, made, cured, and tested in accordance with ASTM Designations: C 172, C 31 or C 192 and C 39, respectively.

"At least 80 percent of the compressive strength tests shall equal or exceed 4000 psi at 28 days. Each test shall be considered as the average of one set of cylinders. A set of cylinders may be one or more cylinders made at one time from the same batch. No cylinder strength shall be discarded in determining whether this requirement of these Specifications is being met.

"If the number of tests below 4000 psi exceeds 20 percent, or if more than four consecutive tests fail to reach this strength, it shall be considered an indication that the control is not as good as assumed or that the average strength of all tests is too low, and the Contractor shall be required to take the necessary steps in his operations or in adjusting his mix to remedy the situation.

Uniformity of Control

"For the information of the Contractor, it has been determined that the probability is that the following average compressive strengths will be needed for varying degrees of uniformity of control in order to meet the requirements that "At least 80 percent of the compressive strength tests shall equal or exceed 4000 psi at 28 days."

Compressive Strength at 28 days	Coefficient of Variation, Percent
4,200	5
4,400	10
4,600	15
4,800	20
5,100	25

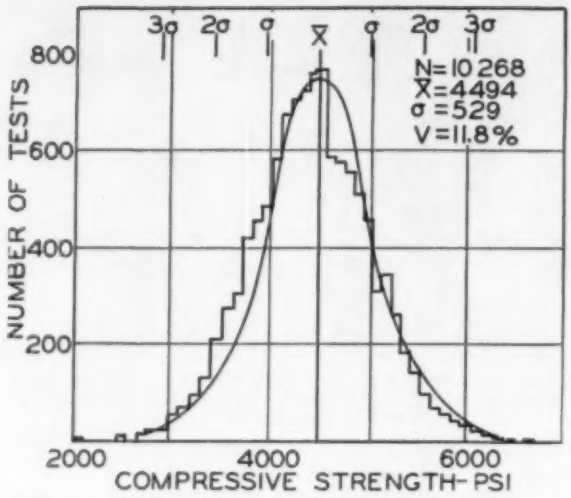


Figure 3—Frequency Distribution Curve for Concrete Pavement—Northern Illinois Toll Highway

Control Charts

Analysis of strength tests was accomplished by means of simplified control charts kept for each contract and for each class of concrete. While these do not contain all the features of formal control charts they do accomplish their intended purpose. Fig. 4 is a portion of a control chart for 3000 psi structural concrete, showing both 7-day and 28-day strength curves plotted daily from strength test reports, permitting an evaluation of probable 28-day results from actual 7-day results. This early evaluation was made necessary by the need for making decisions long before sufficient 28-day strengths were available.

The top half of the chart has individual compressive strength of specimens for seven days (shown by dotted lines) and 28 days (solid lines). These curves show how many cylinders were below specified strength, and therefore whether or not specification requirements were being met. From the 7-day strengths it was possible, after experiences with a given set of materials, to determine whether 28-day strengths were likely to meet specifications.

The bottom half of the chart shows 5-test moving averages of the 7- and 28-day strengths, especially useful for detecting trends and for forecasting from 7-day strengths. Daily plotting of strength values and 5-day averages enabled the engineer to analyze trends and develop a course of action, if necessary. Such action might be a change in cement content of the concrete, or a study of job conditions to locate irregularities of operations or materials. This action was sometimes made on the basis of 7-day tests, if its need were clearly demonstrated at that time.

After results of 30 sets had been plotted, the average, standard deviation, and coefficient of variation were computed. Next the required average

strength was computed for this same 30 sets. Based on this analysis further adjustments to field operations were usually necessary.

This particular chart represents only a short period of time, with an average strength higher than was required for the coefficient of variation attained. In this case, the contractor was permitted to make a reduction in cement content which lowered the average strength in subsequent tests. As long as it was equal to or higher than the required average, the situation was satisfactory. Incidentally, a coefficient of variation of 16.2 percent was only fair. Good should be about 12 percent.

Equations

Notation:

$\bar{X}$ = average strength of all specimens at 28 days

$$= \frac{X_1 + X_2 + X_3 + \cdots X_n}{n}$$

where X_1, X_2, $\cdots$ X_n are strengths of individual sets and n is the total number of sets.

σ = standard deviation

$$= \sqrt{\frac{(X_1 - \bar{X})^2 + (X_2 - \bar{X})^2 \cdots + (X_n - \bar{X})^2}{n}}$$

f_{cr} = required average strength

$$= \frac{f_c'}{1 - tV}$$

f_c' = specified design strength

V = coefficient of variation

$$= \frac{\sigma}{\bar{X}}$$

t = a constant

The value of t depends upon the number of samples (or sets) used in the analysis, and the number of tests that are allowed to fall below f_c'. The ACI Recommended Practice[1] contains a table of values of t extracted from Fisher & Yates "Statistical Tables for Biological, Agriculture and Medical Research". This table can be condensed further for the purpose of this discussion as shown in Table IV. For structural concrete, 90 percent of the tests were required to equal or exceed 3000 psi (one in ten was allowed to fall below the lower limit). Thus f_c' is the lower limit, and, for all practical purposes, the upper limit is not important.

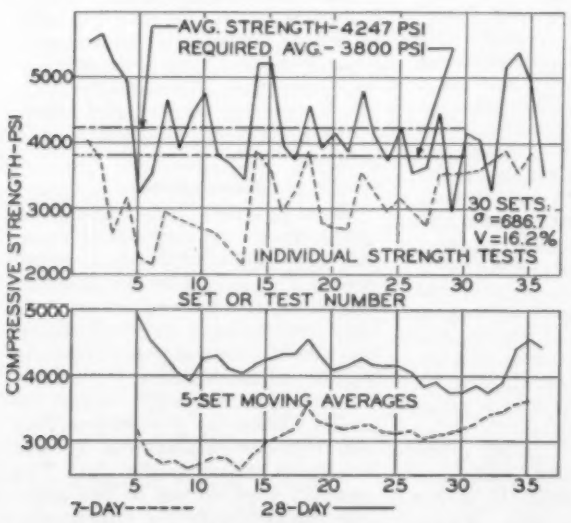


Figure 4—A portion of a control chart for 3000 psi structural concrete

TABLE IV—Values of t

No. of Samples Minus 1	Percent of tests falling within limits $\bar{X} \pm t\sigma$	
	60	80
	Chances of falling below lower limit	
	2 in 10 Pavement	1 in 10 Structural
1	1.376	3.078
30	0.854	1.310
∞	0.842	1.282

Conclusion

The foregoing is a brief introduction to quality control as applied to materials of construction. The importance of control is becoming more apparent as construction becomes more complicated and expensive. Owners are acquiring an awareness of these facts and are demanding better control. Engineers also are aware of the benefits of control and are offering these benefits to their clients and employers.

Control, properly administered, assures quality commensurate with the requirements of the work, avoiding both low quality that leads to deterioration, as well as costly excess quality that is not necessary. For example, realistic control of concrete assures strength and durability values commensurate with design and exposure conditions. Control eliminates the use of sub-standard materials and applies common sense considerations to the evaluation of materials that are borderline in quality.

Based on experience on the Northern Illinois Toll Highway, where 10,268 twenty-eight day tests were made for the pavement alone, it can be concluded that this is a realistic application of quality control. It provides reasonable tolerances, enhances uniformity, and is an improvement over fixed minimum strength specifications.

Present-day technological advances in materials and processes have made mandatory the application of quality control to industry. If an engineer is to keep up with advances in construction practices, he must be prepared to apply these same control techniques to construction.

References

1. "Recommended Practice for Evaluation of Compression Test Results of Field Concrete," Report of ACI Committee 214; *Journal of American Concrete Institute*, July, 1957, pp 1-19.
2. Abdun-Nur, E. A., and Waddell, Joseph J., "Control of Concrete Mixes", *Journal of American Concrete Institute*, March, 1959, pp 947-961.
3. "ASTM Manual on Quality Control of Materials," Special Technical Publication 15-C, American Society for Testing Materials, January, 1951.

a decentralized TEAM APPROACH To Quality and Reliability

T. E. SMITH and A. W. WORTHAM
Semiconductor-Components Division
Texas Instruments Incorporated, Dallas, Texas

Introduction

The accent on reliability has generated considerable discussion concerning the most effective organization and program to achieve maximum quality and reliability. While there is probably no organizational structure that would adequately fill the needs of all types of industry, there are certain concepts and philosophies which should be common to all.

If we accept the basic tenet that quality and reliability must be *designed* and *built* into a product and assign responsibilities to the engineering and manufacturing organizations accordingly, an effective program can be achieved regardless of the organization structure *per se*

In some types of industry it is felt that the reliability organization should be a part of engineering, in others a part of quality assurance. In the aircraft and missile field there appears to be a trend toward an independent reliability assurance function monitoring *both* engineering and quality control. There is undoubtedly merit in all three concepts and it is not the intent of this article to claim superiority of any one program over others.

Just as no one type organization is best suited for all types of industry or even for all product divisions or subsidiaries within a company, so too can an originally effective program be obsoleted by expanded product lines, company growth and increased reliability and quality requirements. Quality management must therefore be constantly on the alert to provide top management and the customer with the most effective and economical quality and reliability program possible. We feel that quality and reliability are too closely allied to be separated; that engineering, manufacturing and quality assurance have joint responsibilities in this area; and that maximum success can be achieved only through teamwork of these functions. It is this type of program therefore that we wish to describe.

ASQC LCS Codes 810:40;60;70:428

Organization

Our company was among the first electronics manufacturers to inaugurate a formal statistical quality control program in 1949. However, it was not until we began high volume production of semiconductor devices and other electronic components that the opportunity and need arose for the use of more advanced statistical methods. We therefore began a planned quality/reliability program in 1957 which has included acquisition of highly qualified professional personnel, intensive formal training of all quality assurance personnel in both basic and advanced statistical methods, and development of a more effective organization through consolidation of common functions and decentralization.

The Semiconductor-Components Division is a completely autonomous product division manufacturing over 150 types of transistors, diodes, rectifiers, precision resistors and solid tantalum capacitors. The division was originally a centralized engineering/manufacturing type organization as shown in Fig. 1. To provide a more effective organization for growth and expanded product lines the division was later decentralized into six principal product departments with each responsible for product engineering and manufacture of specific product lines. It was at this time that a planned three-stage evolution of the quality organization began. The first step was to acquire the qualification and evaluation branch of the engineering department and develop it into a reliability assurance activity. To make the more advanced scientific problem solving methods of Operations Research readily available to our reliability program, this branch of industrial engineering was also merged with the quality department. The original quality control department, reliability assurance and operations research then became branches of a newly-formed Quality Assurance Department as shown in Fig. 2.

The second stage of our organizational development was to decentralize the reliability assurance and quality control branches into sections specializing in the products manufactured by a specific product department. Following a six-month intensive training of all personnel in quality control and reliability assurance methods, these two functions were then consolidated into productized branches and grouped to best serve common interest. (See Fig. 3)

Each Quality Assurance branch has common quality control, reliability evaluation and engineering functions. Quality control is responsible for the evaluation and quality assurance of all incoming materials and chemicals, process controls, final test and acceptance of the end product, and vendor/customer quality service. The reliability section performs environmental and life test evaluation of pre-production samples of product for product engineering and sustaining weekly reliability tests throughout the production life of the product. The quality assurance engineering section provides staff assistance to both the quality control and reliability evaluation sections in conducting process and product capability studies and is responsible for a continuing program to improve the quality and reliability of all products under the cognizance of the specific quality assurance branch.

Due to a considerable quantity of purchased material being common to several type products, the incoming material control function is administered by the Diode Rectifier Branch for all Division activities.

Responsibility

New products pass through a three-stage development. From our Research Division, which serves all product divisions, come the original idea, basic research and development, and laboratory models. The second phase is development of the feasibility of manufacture and reliability which is accomplished by the engineering development department of the cognizant product division. The product then moves to the engineering branch of the product department for development of detail

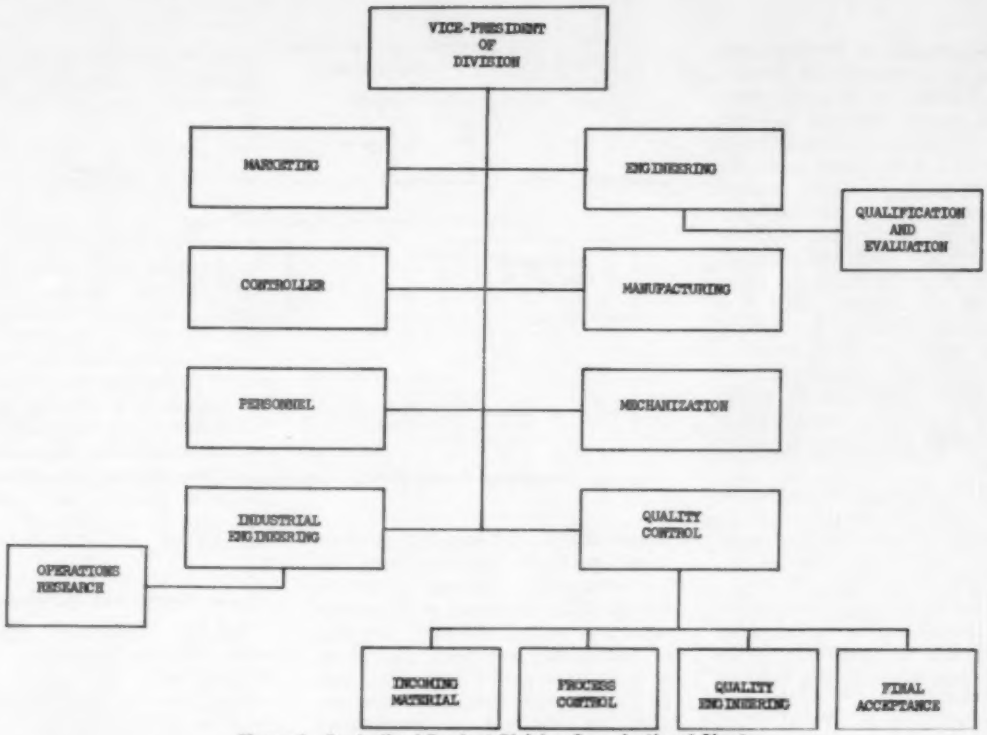


Figure 1—Centralized Product Division Organizational Chart

manufacturing specifications and processes and for final evaluation of technical capability. Following a thorough environmental and reliability evaluation by Reliability Assurance and management approval, the product moves to manufacturing for regular production with the product department engineering group continuing to furnish sustaining engineering throughout the production life of the product.

The manufacturing organization also has well-defined responsibilities for quality and reliability. These include strict adherence to material, process and product specifications, and performance of all detail tests necessary to achieve maximum defect prevention and reliability.

The prime responsibilities of quality assurance are: pre-production quality and reliability evaluation of material and product; sustaining weekly reliability evaluation of products; production process controls; assurance that all incoming material and outgoing product meets specifications, and a continuous program of quality and reliability improvement through more effective control and improvement of incoming materials and manufacturing processes.

Effective Process Control

There are many definitions of a quality product but since all companies are obviously in business to make money, one which has always appealed most to the writers is "A quality product is one which satisfies the customer's requirements and makes an equitable profit for the company". It is fairly obvious therefore that a quality organization must not only be concerned with the cost of producing the product but with the costs of the quality and reliability effort as well.

Given brute force resources the desired reliability would be fairly simple to attain, but the costs would devour the profits and we would not long survive as a company. One of the first objectives of quality assurance engineering, therefore, is to evaluate the operations involved in manufacturing the product, from incoming material to outgoing shipments, and determine at which points process control can contribute the most towards defect prevention, cost reduction and reliability. Flow charts are prepared for each product showing each manufacturing and quality control operation. An abbreviated example of a typical flow diagram is shown in Fig. 4.

There will normally be about 60 manufacturing and 25 quality control operations for each product manufactured. The operating flow chart lists each operation and the applicable specification. The quality control hexagons also call out the applicable quality assurance specifications. In the manufacture of high volume components it is frequently more economical to continue processing a known small percentage of defective units which will be detected in a subsequent operation than to screen out earlier. This can be determined by a cost/yield analysis of the various operations involved. This technique is also very useful to the quality control engineer in determining where process controls will produce the greatest improvement in yields and quality.

Reliability Assurance

In the past military and industrial equipment requiring operation under extreme environmental conditions received pre-production design reliability evaluation only —with little formal assurance that production models met the reliability specifications. In a sense this was a satisfactory criterion. Evaluation testing is costly, being in many cases destructive. Equipment in this period was less complex, entailed fewer component parts and consequently achieved satisfactory overall equipment reliability. More important, a failure was not as serious as it is today in high-speed aircraft, missiles, and more complex industrial applications. Due to the increasing tempo for reliability improvement,

one might be led to believe that reliability is progressively deteriorating. While it is in some cases true that more complex systems are less reliable than the simpler versions of a few years ago, the component parts of these equipments are actually considerably *more* reliable. Equipment reliability is dependent upon the reliability of the many component parts making up the system. Thus it is quite possible that an equipment of a few years ago with 50 component parts could conceivably be more reliable than one of today with 1000 parts even though present component reliability is vastly improved.

Reliability is proportional to the quality of design, quality of manufacture and effectiveness of quality control and might be defined as "Quality with time." The current formal definition of reliability is "The probability of satisfactory operation for a specified period of time when used in the manner for which designed." From this definition it can be seen that operating and environmental tests of short duration are no longer acceptable criteria for determining reliability. Reliability assurance now requires extensive testing under maximum operating and environmental conditions for periods of one thousand hours and greater.

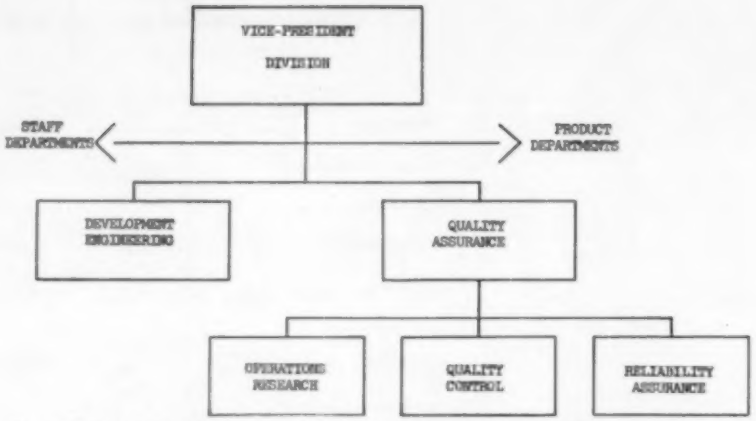


Figure 2—Decentralized Product Division—Centralized Quality Control and Reliability Assurance

All products manufactured by our company receive extensive life qualification tests before going into production. Weekly samples of production are then placed on a one - thousand - hour life test throughout production of the device. In addition lot acceptance life tests are performed on each shipment of certain military qualified devices. Such tests are costly from the standpoint of components used in destructive testing alone and a goal next in importance to *achieving* reliability is a more economical method of *determining* it.

Statistical Methods

Quality Assurance employs a wide range of statistical tools including both the control and investigative or problem - solving type. Both attribute and variables sampling techniques are used to control all incoming materials. Sampling in conjunction with control charts is used in process controls. Various forms of experimental designs, regression analysis, correlation analysis, etc., are

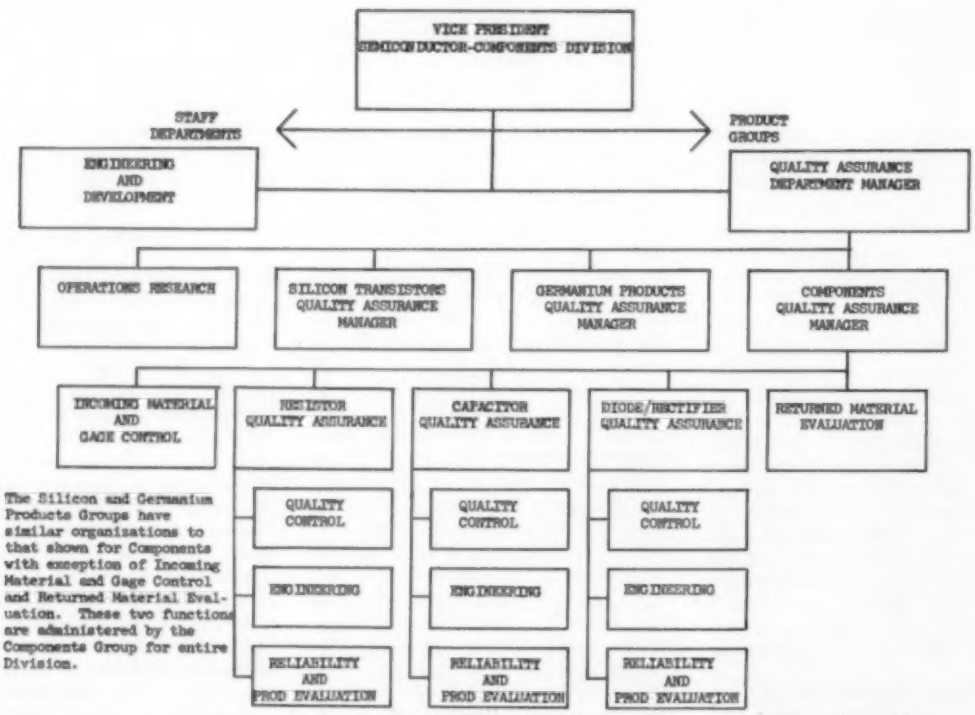

VICE PRESIDENT
SEMICONDUCTOR-COMPONENTS DIVISION
STAFF DEPARTMENTS
PRODUCT GROUPS
ENGINEERING AND DEVELOPMENT
QUALITY ASSURANCE DEPARTMENT MANAGER
OPERATIONS RESEARCH
SILICON TRANSISTORS QUALITY ASSURANCE MANAGER
GERMANIUM PRODUCTS QUALITY ASSURANCE MANAGER
COMPONENTS QUALITY ASSURANCE MANAGER
INCOMING MATERIAL AND GAGE CONTROL
RESISTOR QUALITY ASSURANCE
CAPACITOR QUALITY ASSURANCE
DIODE/RECTIFIER QUALITY ASSURANCE
RETURNED MATERIAL EVALUATION
QUALITY CONTROL
ENGINEERING
RELIABILITY AND PROD EVALUATION
The Silicon and Germanium Products Groups have similar organizations to that shown for Components with exception of Incoming Material and Gage Control and Returned Material Evaluation. These two functions are administered by the Components Group for entire Division.

Figure 3—Division Organizational Chart

used in process trouble shooting and other problems. Inspection, which is defined as sorting and screening, is not performed by quality assurance personnel. Incoming material which is rejected on a sampling plan is returned to the supplier, or, if urgently needed, screened by production personnel under the supervision of incoming quality control. One hundred percent tests or inspections required in production are integrated into the manufacturing process and accomplished by production personnel. Final acceptance of the product by quality assurance is also performed on a statistical basis. Rejected product is screened by production personnel and resubmitted to quality assurance.

Statistical methods can be invaluable tools to the research and development engineer as well as to quality assurance and reliability personnel, and one of the greatest contributions the quality engineer can make to his company and profession is to introduce these tools to engineering personnel. Experimental designs are not only superior in every way to the trial-and-error method of determining the effect of variation but frequently provide a solution to a complex problem that can be obtained in no other way.

A very good example of this is what appeared to be an insurmountable problem within our engineering department. A large percentage of transistorized radio receivers was found to be subnormal under certain conditions of performance and it was urgent to determine if the cause was due to variation in the receiver circuitry or in the four transistors involved. A Graeco-Latin square experimental design was therefore set up and 275 measurements made with 11 receivers and 55 transistors of each of four types. The analysis of variance revealed that over 50 percent of the total variation was being contributed by the receiver, 28 percent by one transistor type and the remainder by the other three transistor types.

If we eliminated all of the transistor variation, we would still have over 50 percent left in the receivers and undoubtedly continued mal-functioning. The obvious source of variation to concentrate on was therefore the receiver. A simple design change in the circuit eliminated the difficulty. Using the trial-and-error method on this problem would have required over one million measurements with probably inconclusive results and a high mortality rate of receivers, test equipment and engineers.

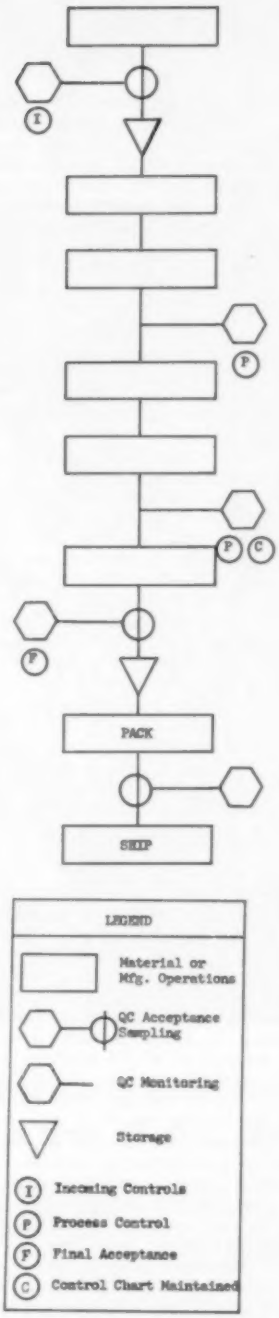


Figure 4—An Abbreviated Example of a Typical Flow Diagram

Operations Research

Operations Research is a fairly new management and industrial tool and is usually found on a corporate or division staff level. Since our goal is to produce reliable products second to none, it was felt that this function could best serve the interests of the division and company as a branch of quality assurance.

One of the major factors that make operations research an intensely interesting creative field is that there is no set pattern of approach to operations research problems nor any list of techniques that can be applied "cook book" fashion to obtain solutions to the problems. The scope and varied nature of industrial and business problems is such that the engineers, scientists, and mathematicians of the Operations Research Branch must of necessity fully utilize the breadth of their education and experience and, in most cases, stretch beyond this into new fields and disciplines.

The operations research approach to problem solving at Texas Instruments, then, is primarily to have expert personnel who have mastered the disciplines of their own technical fields so thoroughly that they can apply this knowledge in new situations. In addition, they must be endowed with above average ingenuity, initiative and creativity. Thirdly, operations research requires good communications and interchange of ideas within the group, within the company, and with others in technical fields. Thus, the combination of the cumulative knowledge of its personnel, plus ingenuity, initiative and creativity, plus the free flow of ideas and information, forms the basis for all operations research functions. If we are to speak of set approaches or techniques we must speak in the past tense, that is, to problems already completed.

Conclusion

In conclusion, the writers would like to re-emphasize that while we feel we have the most effective quality/reliability organization possible for our particular operation and requirements, it will not necessarily prove best for other companies and conditions, nor, will it necessarily fit our own needs a year or two from now. Although considered best at this time, changing conditions may require additional modifications and refinements in our organization—and if in the interest of better quality and reliability of TI products — they will, we are sure, be made.

What's New?

ROY A. WYLIE, *Editor*

P-1-6—The TRIPLETACH is Metron's new hand tachometer which features small size, light weight, rugged construction and a price of only $95. A metal case contains the completely sealed meter movement, the printed circuitry, the speed pick up and its retractable cord, and provides handy storage space for the shaft tips and other accessories. The series 27 Tripletach measures from 200 to 10,000 rpm; Type B from 100 to 5,000 rpm; and Type C from 20 to 1,000 rpm. Three scales, changed by a thumb switch, permit fine readings within these measuring ranges. Accuracy is ±1 percent of full scale deflection. Accessory equipment includes a carrying case, an adapter for extending ranges, another adapter for using the Tripletach in cramped quarters, and a special disc for the direct measurement of surface speeds.

* * *

P-1-4—Fiber Optics, a revolutionary new system for transmitting images and light around corners or through uneven contours, utilizes long thin fibers of optical glass. The term, "Fiber Optics," has been applied to this principle of light and image transmission through optical glass fibers and to instruments containing optical fiber transmission systems. The development and testing of instruments utilizing fiber optics has been underway for several years at the A.C.M.I. Optical Instrument plant. Industrial fiber optic borescopes have been made for visualization in inaccessible curved areas where a flexible instrument capable of adapting itself to irregular contours is required. Illumination may be provided by separate flexible fiber optic light carriers, illuminated at the proximal end or by an annular light carrier which is integral with the fiber optic image carrying borescope. This type of illumination provides an intense cold light at the distal end of the instrument, permitting such an instrument to be used in hazardous locations such as for the inspection of solid fuel rockets. Flexible Fiber Optic Borescopes are available in sizes 0.100 inches to 0.500 inches in diameter and in 12 inch, 24 inch, 36 inch and 72 inch lengths, covered with stainless steel spiral springs, latex or reinforced plastic. Illumination is by means of an annular light carrier or separate flexible fiber optic light carrier.

* * *

P-1-5—A new lost cost electronic "watch-dog" device automatically detects, counts and indicates imperfections in yarns and fibers being processed in textile mills. The new Lindly series 1000 Ultra Yarn Inspector is capable of simultaneously checking as many as several thousand strands of multi-filament synthetic yarns for textile and tire cord as they move through the warping process. At the heart of the fully transistorized device is a highly sensitive photoelectric system that "watches" the strands of yarn as they speed across an inspection bar. Defects measuring a fraction of a thousandth of an inch can be detected. However, the sensitivity of the system also can be adjusted to detect only certain types of flaws while permitting others to pass unnoticed. The yarn inspector is constructed on a modular principle. In the event an electronic module breaks down, the faulty unit will be replaced immediately by the manufacturer, although many users will find it convenient to stock spare modular sections. An auxiliary unit available with the inspector automatically corrects the operation of the device to insure that it is functioning properly at all times. Price of a typical Ultra Yarn Inspector is $1,850. with delivery in five to six weeks.

Our Cover

Vought Electronics Tests Multi-Polarized Antenna

Now with one antenna, polarization modes best suited for tracking a particular missile or space vehicle can be chosen by either the system or its operator.

A design for the UHF band is presently in production and will be used on the latest Pacific Missile Tracking Vessels.

At the time this photograph was taken, antenna pattern checks and qualifications tests were being performed by Quality Assurance.

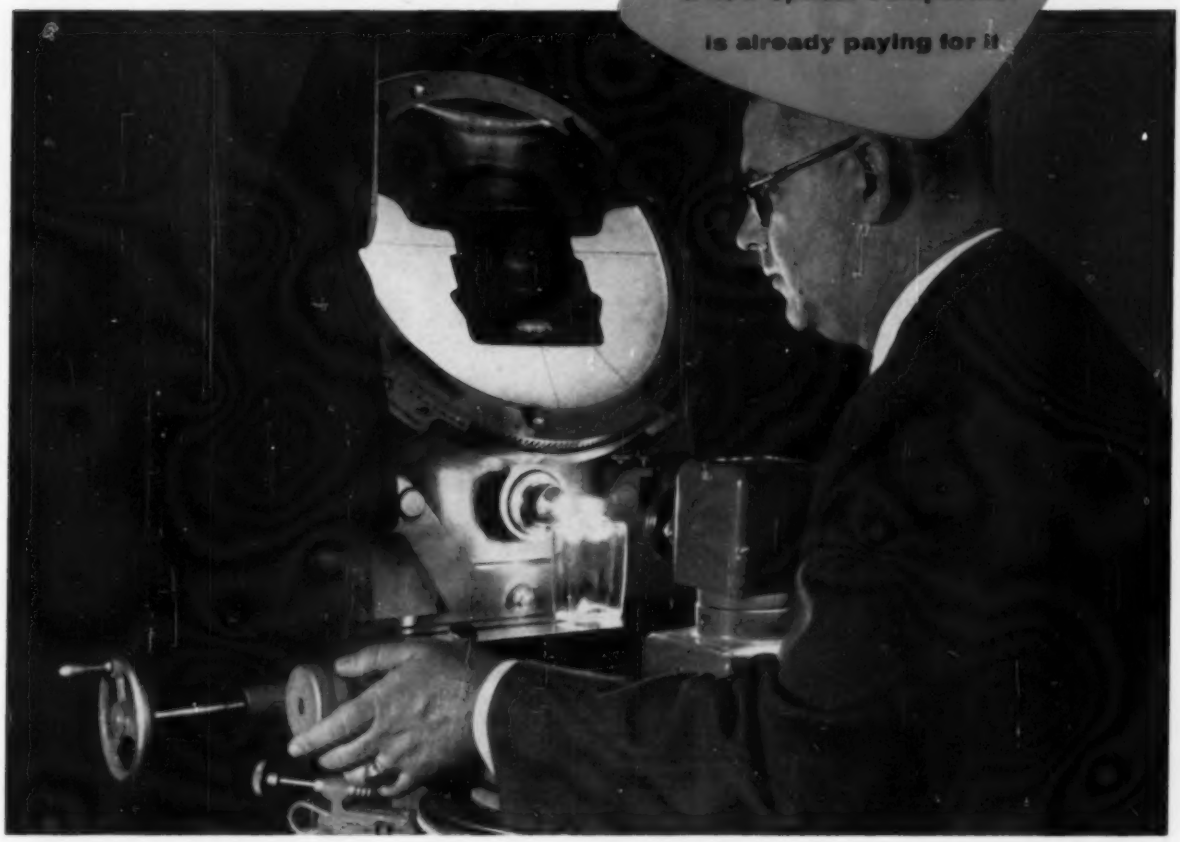
P-1-2—Production of a new precision capacity measuring instrument featuring high accuracy, simplicity of operation and a 1 MC measuring frequency has been announced by C.E.S. Electronic Products. The model 402D Micro-Miker measures capacity from 0-1000 uuf in three ranges and inductances from 0-140 uh in one range. Accuracy is ±2 percent of the reading for capacity and ±3 percent for inductance. Resolution is 0.1 percent of full scale. The low measuring voltage makes it possible to measure the small signal capacity of diodes, transistors and tubes (including Miller Effect Capacity) at 1 MC to yield typical in-circuit results. Model 402D Micro-Miker is priced at $785. and delivery is 60-90 days.

* * *

P-1-9—A new, inexpensive line of cobalt 60 radiography cameras has been announced by Radionics Incorporated. The family of five model 60 machines have capacities of 1, 5, 10, 30, and 100 curies of cobalt 60 respectively, with weights ranging from 190 to 1100 pounds. They are designed primarily for panoramic and internal radiography, where the machine is used to position the source as required. All of the units may be obtained with provisions for containing and using more than one radioactive source. In this fashion, the operator has a choice between a stronger or a weaker cobalt 60 source, or between a cobalt 60 source and an iridium 192 source. The multiple units are really two or three machines in one and the cost of the extra source positions is far less than that of additional cameras. Cobalt 60 is useful in radiographing from ¾ inch to over 12 inches of steel. Iridium 192 has a range of from ¼ inch to 3 inches of steel. A model 60 unit with both iridium 192 and cobalt 60 sources offers a radiographic capacity of from ¼ inch to over 12 inches

JONES & LAMSON
OPTICAL COMPARATORS

the man who needs
a new optical comparator
is already paying for it



Packaging quality at Bristol-Myers is safeguarded by the J & L Optical Comparator

The traditional high quality of Bristol-Myers products is protected through manufacture by a system of rigid quality control operations.

Due to the nature of the products, packaging is an extremely important factor. For this reason, the company's packaging research department uses the J & L Optical Comparator for the precise measurement and inspection of various packages and package components.

For instance: Development of the BAN roll-on package required suppliers to meet and maintain tolerances for glass and plastic molded parts, to a degree previously considered impractical. The J & L Comparator made it possible to classify components into minimum and maximum tolerance groups rapidly and accurately.

Improvements involving changes of .001" were expedited by the comparator's ability to detect such changes quickly and precisely.

The J & L Comparator has proved to be of great value, also, in contour studies, and in the precise mating of components. Typical examples: For IPANA PLUS, measuring the fit of plug into polyethylene bottle, and the fit of the stand-up cap onto bottle and into plug; For BUFFERIN, contour studies of glass bottle bead and polyethylene snap cap, to assure a moisture-vapor tight closure.

Bristol-Myers uses the J & L Comparator in various quality control applications, particularly on items where conventional measuring devices are inadequate.

Investigate how the J & L Comparator can help improve *your* manufacturing operations. New catalog No. LO-6024 is available on request. JONES & LAMSON MACHINE COMPANY, 510 Clinton St., Springfield, Vt.

Turret Lathes • Automatic Lathes • Tape Controlled Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

of steel. The cameras are mounted on pneumatic tired wheels and are provided with handles for convenient movement about the shop. Prices range from $1,900 to $3,500.

* * *

P-1-1—United States Gauge has announced a new spring tension gauge, used for measuring the "breakaway" force needed to move an object held by a spring member, inertia or friction. The uniformly graduated dial and knife-edged pointer permit accurate readings over the entire scale. It is a "push-pull' instrument with zero reading at the top of the dial. Compression readings move the pointer counter-clockwise; tension moves the pointer clockwise. Guaranteed accuracy for either side of scale is two percent. A maximum-reading red pointer is provided for taking readings where the dial cannot be seen easily. Zero adjustment is secured by turning a knurled shank around the "push-pull" rod. The extension hook at the end of the rod is removable and may be replaced with a hook designed for special applications. The dial is 1½ inches in diameter and the stainless steel extension hook is 3¾ inches long. Five ranges are available from 0-16 ounces to 0-80 ounces.

MEASUREMENTS TO 10 MILLIONTHS

. . . read directly on a counter!

CARSON-DICE AUTOMATIC Electronic Micrometer

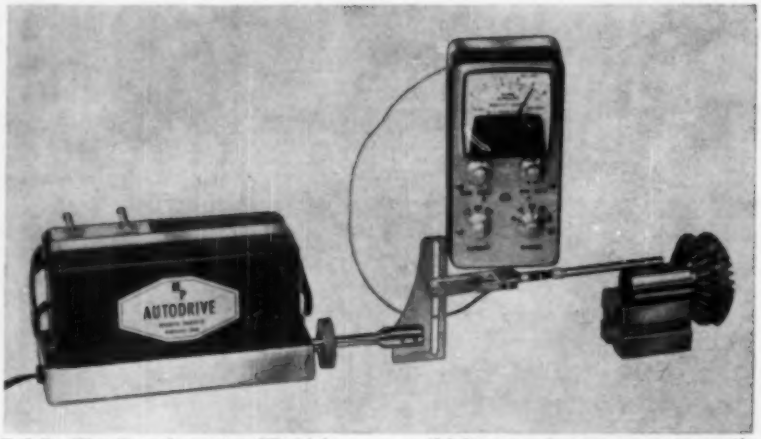
Accurate! The Carson-Dice Micrometer permits measurement to 10 millionths on any part or material, hard or soft, fragile or compressible.

Foolproof! Model P D R (shown) eliminates operator discrimination, measures with 0-pressure on conducting parts . . . or standard reference pressures of 1.5, 5, 10, and 20 grams on conductors or non-conductors.

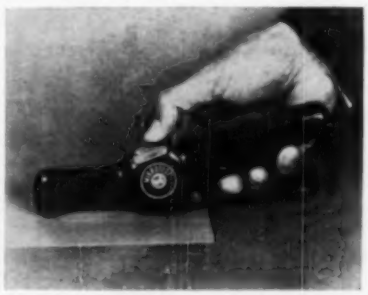
FAST! Unexcelled for high-speed readings on close tolerance precision parts, semi-conductors, deposited films, grids, coated cathodes, diaphragms, wire.

Address inquiries (and submit your measurement problems) to:

J. W. DICE COMPANY
Englewood 10, N. J.
LOwell 9-0471



P-1-7—The Roughometer SR-14 is a portable instrument for the measurement of surface roughness of metal or plastic parts. It is contained in a plastic case 6¼ x 3¼ x 3¼ inches that has a storage compartment for the pickup and calibration standard. Automatic reel rewind is provided for the pickup cable. The amplifier consists of a feedback-stabilized tube and transistor circuit. It is battery-operated; battery life is 700 hours. A small pickup ($\frac{15}{64}$ inch diameter by three inch length) has been designed for hand operation or for use with a mechanical tracer. Two holders are provided, enabling the pickup to be used both for measuring the roughness of holes ¼ inch in diameter or larger, and outside surfaces having a diameter of $\frac{1}{32}$ inch or greater. Weight is 2½ pounds. The Autodrive SR-13 provides a reciprocating mechanical motion of 0.032 to 0.9 inches in length for the Roughometer pickup. The uniform low-noise mechanical stroke facilitates inspection, makes it easier to measure fine finishes, and provides the highest possible accuracy for all measurements. The ten inch extension attachment, reversal bar, and the angle bracket make it possible to measure deep holes and other surfaces that are difficult to reach.



P-1-8—The Mikrotest Dry Film Thickness Gages now are available in two ranges; one for lacquers, enamels, etc., has a range of 0 to 20 mils, while the other model is for measuring plating, galvanizing, etc. It has a range from 0 to 2 mils. Both of these gages will measure a thickness of any non-magnetic coating on a magnetic base. Both instruments are easy to use and respond with a click that can be both heard and felt when the correct measurement is made. Human differences in touch do not affect the readings—a number of workers can test the same coating and get the same result at a given spot. Surfaces can be measured in any position.

P-1-3—A full color, dual purpose Polariscope has been designed by the Bethlehem Apparatus Company for both bench and portable use in detecting strains in glass and plastic. The Model P5 instrument is used in glass-working facilities, glass production plants, the electronics and optical industries and related activities. It is useful for such purposes as detecting strains in ring seals and other parts of laboratory glassware, identifying strain patterns in tempered glass, inspecting glass-to-metal seals, examining strains in optical frames, and studying strain patterns in plastic scale models. Full color of the strain pattern as viewed through the instrument insures high sensitivity and clear detail. Lens distance can be adjusted for specimens of any diameter. Light weight of the apparatus—only 1¾ pounds—makes it easy to use as a portable unit. Power may be obtained from any 110 volt outlet. The Polariscope is constructed of aluminum and steel with a baked hammertone grey finish. It sells for $65.

WHERE PRECISION IS PARAMOUNT you'll find PLA-CHEK® GAGES

example

HUGHES AIRCRAFT COMPANY

where for 10 years PLA-CHEK Gages have been speeding inspections while guarding Hughes precision and quality

Just as the Sentinels of Freedom (at left) stand guard over America's security, so do the PLA-CHEK Gages (center) in one Hughes Inspection room guard the precision and quality of these Falcon Missiles, manufactured by Hughes Aircraft Co.

Nowhere will you find precision and accuracy more demanding than in the manufacturing of guided missiles and airborne electronic armament systems. And volume production demands speed. These are reasons why you'll find so many Cadillac PLA-CHEK Gages at work in the plants of Hughes Aircraft Company.

Ten years ago the first PLA-CHEK went to work for Hughes. Today 120 are in daily use speeding inspections and guarding precision at various Hughes' plants. Here's proof of PLA-CHEK performance.

Speedy inspections? Yes! PLA-CHEK Gages can be set 5 to 20 times faster than other methods of comparable accuracy. Precision? Yes! PLA-CHEK Gages are *guaranteed* accurate to .00005″ through the entire range of the 6″, 12″ and 18″ sizes—to .0001″ through the range of the 24″ size. The 36″ and 48″ sizes are *guaranteed* accurate to .0001″ in any 24″ length and to .0002″ over their entire range.

PLA-CHEK Gages are available in a full range of sizes to meet every inspection and layout requirement either at the surface plate or the machine. Let us tell you how you, too, can speed inspections, maintain extreme accuracy, guard the quality of your work and *save money* with PLA-CHEK Gages. Write for complete, detailed literature.

Cadillac GAGE COMPANY

P.O. BOX 3806 • DETROIT 5, MICHIGAN

P-12-4—A new compact multi-purpose portable dial micrometer thickness gage designed for gaging all types of small machine parts, wire, laminates, veneer, metal sheets and strips, plastics, rubber, mica, leather, paper stocks and boards, etc. has been announced by Quadra-Continental. The new pocket-size gaging tool which has a maximum working range of 0.500 inches has a 2 inch dial calibrated to 0.00025 inches. One revolution of the large main pointer equals 0.050 inches while the small revolution counter records up to the 0.500 inch capacity. The dial can be reset to zero position when necessary to compensate for temperature changes or other variables. Overall dimensions of the gage are 4¾ inches x 2⅞ inches, maximum throat depth is 1 11/16 inches, weight 5 ounces. A finger-operated lifting lever retracts the spring-loaded contact plunger, then is released until the work-piece is engaged and the reading taken. The constant-pressure spring contact plunger enables accurate gaging of compressible as well as rigid materials. The ⅜ inch diameter hardened steel contact discs have been ground and lapped flat. The QUADRA Dial Thickness Gage, in a hardwood case, is priced at $19.95.

* * *

P-1-11—A new static Voltmeter for the textile industry, made in Switzerland by Rothschild of Zurich, measures static charges from 0 to 5,000 volts under actual production conditions. The device uses a roller electrode to make precise measurements of specific charges on individual threads and strips as well as field measurements. Static electricity has long been a serious problem to synthetic yarn and fabric producers because these materials have a high electrical resistance and it is difficult for a static charge to be dissipated to the ground. As a result, these fabrics are often difficult to handle, cause discomfort to the wearer, attract dirt, and even cause a fire hazard by generating sparks. Anti-static preparations can cut down the disadvantages of synthetics, but they must be carefully controlled and their effects accurately measured. The Rothschild Static Voltmeter permits simultaneous measurements and recordings of charges over eight ranges: 1, 5, 10, 50, 100, 500, 1000, and 5000 volts. This broad sensitivity makes the Static Voltmeter equally useful on the production line or in the laboratory. A probe electrode permits measurements of the potential directly on the surface of the fabric. The density of the charge at various points can be measured in this way, and the effectiveness of the anti-static preparation checked. The small voltage ranges permit measurements on individual threads and allow precise tests of the effect of various concentrations of anti-static preparation. Surface conductivity of the material may be measured simultaneously with measurement of the static charge. A special measuring electrode will measure resistance up to 10^{15} ohms.

P-1-10—A new type of ductility testing machine designed for foil and thin sheet work is now available. The Detroit Thin Sheet Metal and Foil Tester (Model TSD) is designed to permit quick, accurate readings for both experimental and production work. Gripping pressure and movement of test piston of the machine may be adjusted to different levels independently of each other to fit whatever test conditions are desired. Tests are carried out in full view of the operator. The new testing machine is available in five gauge calibrations, ranging from 200 lbs. to 2,000 lbs., for work ranging from 0.002 inches to 0.020 inches maximum thickness.

* * *

P-1-12—MetroLonics, Inc., an independent standardizing laboratory, Burbank, Calif., announces the addition of two new calibration instruments: A Pratt & Whitney Helical Path Analyzer and a Talyrond Roundness Measuring Machine. The addition of the Helical Path Analyzer completes the firm's capability to perform the highest grade of traceable thread gage certifications to meet Department of Defense requirements. The Helical Path Analyzer produces a chart which graphically charts helix deviations and lead error of thread gages or other helix gages. The graph is ruled in increments representing 20 millionths of an inch and each increment is accurate to one millionth of an inch. The addition of the Talyrond Roundness Measuring Machine permits MetroLonics to measure concentricity, roundness, and taper with an accuracy of one millionth of an inch. The Talyrond produces a polar chart on which each 0.1 inch represents 25 millionths of an inch at 4,000 magnification or 10 millionths of an inch at 10,000 magnification. In addition to measuring the roundness of plug gages, gage pins and wires, the instrument is also used to measure high precision cryogenic spheres for guidance systems and precision ball bearings.

* * *

P-12-9—The Rototester developed by Magnetic Analysis Corp., will detect surface flaws of 0.004 inches or more in depth in magnetic or non-magnetic cold-drawn steel coiled wire up to 1 inch diameter. Utilizing the Eddy-Current technique of inspection, the Rototester rotating head mechanism mounts directly on the draw block and the detector unit rotates around the drawn wire as it emerges from the die. At production speeds (approximately 200 feet per minute) flaws one inch and longer are detected. Flaws detected are indicated by a visual light and an audio signal and are shown on an oscilloscope screen. A paint spray marks the flaw area. Provisions are also made for the use of a recorder and a predetermined electronic counter. The recorder shows the magnitude or frequency of faults, and provides a profile view of individual faults. The predetermined counter energizes an alarm when the faults per coil exceeds any preset number.

New Literature Available

L-1-1—Now available is a pamphlet on Thermochrom Crayons and DetectoTemp Paints. Thermochroms are crayons that indicate temperature by change in color. They are applied to a warm surface to check whether an item has either exceeded or not exceeded a critical temperature. DetectoTemps are paints that also indicate temperature by change in color. These are available in powder form to be mixed with alcohol and applied by brushing or spraying on surfaces while the item to be checked is cold. A change in color will then indicate not only the temperature reached, but also the exact area that reached the temperature.

* * *

L-1-2—Five new individual brochures describing the basic models of Jones and Lamson Optical Comparators and Measuring Machines are now ready. Bulletins are: Model FC-30ER, Model FC-30, Model FC-14 and TC-14, Model TC-10 and Model PC-14A.

* * *

L-1-3—A full color and sound, twenty-three minute, 66mm motion picture titled "How to Locate Flaws with Dye Penetrants" has been completed by Turco Products, Inc., and is available for free showing to industrial concerns, technical groups and other interested organizations. The film, which is intended primarily for training purposes, visually demonstrates every aspect of dye penetrant inspection from laboratory theory to production line techniques actually filmed on location during mass production dye penetrant inspections.

* * *

L-1-4—A brochure entitled "Modern Thickness Testing" has just been published by Twin City Testing Corp. Included as part of this study is a description of the various nondestructive methods currently employed for measuring the thickness of organic and non-magnetic metal coatings (including phosphate) on iron and steel. The advantages and limitations of each method are thoroughly discussed in light of thickness measuring instruments now available.

* * *

L-1-5—"Frequency Comparisons Using Roulette Patterns" is a four-page pamphlet available from Textronix, Inc., which gives a detailed presentation of high-ratio frequency comparisons using roulette patterns on the crt of Tektronix Types 502, 503 and 536 Oscilloscopes. The pamphlet includes circuitry for displaying roulette patterns, schematic diagrams, and waveforms for various frequency ratios.

* * *

L-1-6—Black Light inspection of LOX service parts, printed circuit boards, gear trains, etc., is described in detail in new literature published by Ultra-Violet Products, Inc., manufacturer of Blak-Ray black light lamps.

* * *

L-1-7—A special applications section is featured in the new 12-page two color bulletin offered by Non-Linear Systems, Inc., on its Industrial Series digital measuring instruments. The section covers 17 uses of the NLS 481 digital voltmeter and the NLS 781 digital ohmmeter with individual photos and descriptive material.

* * *

L-1-8—Telonic Industries announce the availability of their new catalog No. T-203B, covering sweep generators used for television receiver alignment and production. The new catalog covers descriptions and specifications of sweep generators for both UHF and VHF application, and details various accessories used in conjunction with the generators.

* * *

L-1-9—A 12-page brochure, 704, describes an improved spectrometer system for identifying, tracing and labeling gamma emitting radioisotopes. The GSS-1 system employs a new analytical principle to obtain higher resolution over a wider range of spectra energy than ever before possible. It can analyze emitters within the approximate energy range from soft x-rays to above 6 mev.

* * *

L-1-10—The third and completely revised edition of the Torque Manual is now available from the P. A. Sturtevant Company. Thirty-one new pages of application illustrations, bolt charts, discussions on assembly characteristics, instructions for torque wrench testing, pictures of modified and special torque wrenches, formulae and illustrated explanations for using adapters, attachments and extensions are included.

* * *

L-1-11—Design specifications for the direct reading, variable duty cycle power transistor test set, Model NC-1, are available from Baird-Atomic, Inc. The technical data sheet gives full information on the new instrument which can test both medium and high power transistors.

* * *

L-1-12—A new short form catalog of Vibration Test Systems to 5000 pounds force and expanded line of Dial-A-Gain and other vibration instruments is available from the Unholtz-Dickie Corp.

* * *

L-1-13—"AMA Management Bookshelf" is now available on a complimentary basis to any interested executive who requests a copy by writing on his business stationery. The Bookshelf is the annual catalog of all books, periodicals, and films produced by the American Management Association. Monthly announcements of new AMA publications are also available.

REVIEW

Quality Control

METHODS

AND

MANAGEMENT

THROUGH THE

Third and Fourth

Annual Symposium

TRANSACTIONS

These Symposia were conducted at the Drexel Institute in 1958 and at Temple University in 1959 by the Philadelphia Section, ASQC.

THIRD SYMPOSIUM TRANSACTIONS—$2.00

The Purchasing Agent Looks at Quality Control
Consumer Looks at Quality
Communications in Quality Control
Small Businesses and Quality Control
The Compatibility of Value Engineering Analysis and Reliability
The Theory Behind MIL-STD-414
A Careful Look at a Common Problem in SQC
Enhancing the Value of the QC Function

FOURTH SYMPOSIUM TRANSACTIONS—$2.00

The Design of Industrial Experiments
Quality Control Plus—A Dynamic Approach
The Correlation of Customer Requirements with Manufacturing
The Increasing Demand for Excellence
The Quality Control Manager as an Executive
Making a Multiplant Supplier Rating System Produce
The Role of QC in Industrial Competition
Army Quality Assurance

Send Your Check Or Money Order to

ASQC
161 W. Wisconsin Ave.
Milwaukee 3, Wis.

BOOK REVIEWS

W. D. Baten, Editor

26 University Drive, East Lansing, Mich.

TABLES OF TOLERANCE-LIMIT FACTORS FOR NORMAL DISTRIBUTIONS, by Alfred Weissberg and Glenn H. Beatty. Published by Battelle Memorial Institute, 505 King Ave., Columbus, Ohio, 1959, pages 1-14. Can be obtained free of charge as long as supply lasts. Reviewed by W. D. Baten, Michigan State University, East Lansing, Mich.

These tables enable one to find tolerance limits of the true arithmetic mean of a population or a universe from the arithmetic average and the standard deviation of a sample. These limits are based upon sampling errors of the sampling mean and sampling standard deviation.

In the beginning detailed mathematical explanations are given of the development, together with descriptions of the many difficulties encountered in the computational work in securing values in the tables. Several examples are clearly presented showing how the tables are to be used.

By the use of $\bar{X}$ and s and the tables, various confidence limits can be found for the value of μ, the population arithmetic average. Confidence limits can also be found for population means from data obtained from analyses of variances together with those for expected values of regressions.

One-sided tolerance limits can also be obtained by the use of these tables.

Due to the diversification of the following book two reviews were obtained.

CUTTING INDUSTRIAL COSTS WITH ISOTOPES, Second Edition, by CCH Editorial Staff, Chicago and New York, Commerce Clearing House, Inc., 256 pages, heavy paper covers, $5.00. Reviewed by Professor Ira B. Baccus, Electrical Engineering Department, Michigan State University, and Dr. James L. Fairley, Chemistry Department, Michigan State University, and also chairman of the Radioactive Isotopes Committee.

Professor Ira B. Baccus

The publication appears complete and up-to-date. It includes sufficient information on various applications of isotopes to furnish ideas to those whose knowledge of the theory and use of isotopes may be limited.

The book is not sufficiently technical to enable a reader to design an industrial installation (and it makes no claim on this point). By including a list of users it gives those interested an opportunity to make inquiries direct to the companies. Engineers who can design (or discuss) an industrial application will undoubtedly be recommended by a user of the isotope technique of reducing costs.

Dr. James L. Fairley

This book provides in a compact package of about twenty pages of descriptive text a veritable goldmine of information relative to the nature of radioactive isotopes and their practical applications. The material is presented in a clear, easily-understood manner, yet it avoids carefully the sin of misleading oversimplification. Much of this descriptive material is a scanning of the present uses of isotopes and is obviously intended to needle the imagination of the reader who has not as yet explored the possibilities inherent in these radioactive atoms. These uses are so ingenious, so amazingly diverse, and yet so astoundingly simple in application, that it is difficult to see how this aim could miss.

The remainder of the book is an extensive listing of those firms currently employing isotopes, providing for the potential new user the necessary contacts for further, more detailed information concerning specific applications.

In brief, it is the opinion of the reviewer that no manufacturer can afford to be ignorant of the contents of this book.

QUALITY CONTROL AND RELIABILITY HANDBOOK (INTERIM) H 109. STATISTICAL PROCEDURES FOR DETERMINING VALIDITY OF SUPPLIERS' ATTRIBUTES INSPECTION, May 6, 1960, Office of the Assistant Secretary of Defense (Supply and Logistics), Washington 25, D.C. Reviewed by Herman H. Bogin, Parke, Davis & Company.

This is an interesting handbook with potential value in practically any vendor-vendee relationship. In the first place, the tables offer information which might be rather difficult to otherwise obtain. It is true that some statistical texts include tests of difference, but these tests would generally be more difficult to apply than the tables found in the handbook.

Secondly, the examples given in the handbook are well chosen and should be easy to understand, provided the reader knows something about mathematical symbols.

Thirdly, the greatest value lies perhaps in the ability to check consecutive lots, especially when the number of defects is close to the acceptable limits.

The handbook uses many mathematical terms and symbols. Anyone without some knowledge of statistics would probably find the handbook difficult to follow. One would also have to have a rather thorough knowledge of MIL-105.

There is one phase of attribute inspection which we feel is of greatest importance in developing an inspection system which will be realistic and successful. Such a system must start with a clear-cut definition and description of what constitutes a defective. Next, there must be a strict adherence to the specifications thus established.

It is so easy to have "floating" standards when inspection pertains to attributes rather than to variables. In many cases pictures or

(Please turn to page 30)

USE A QUINCUNX . . . .

to make your quality talk more forceful

to make your in-plant training course more effective

The Quincunx is a must for presentation of basic quality control principles. Demonstrates visually to your audience how a Normal Distribution pattern is formed. Also demonstrates how various Non-Normal distributions are formed.

Lightning Calculator Co.

Box 6192

St. Petersburg Beach 36, Fla.

WE HAVE THE ADVANCE SCHEDULE...

OUR SPEAKERS ARE READY...

Please turn page for a Preview of the 15th Annual Convention Program . . .

Advance Program

15th SQC ANNUAL CONVENTION

Hotel Sheraton

MONDAY

Goals for Quality Management in the Next Decade
JOSEPH M. JURAN

Evaluation of a Company's Quality Control Need
LEONARD A. SEDER
Leonard A. Seder & Associates, Quality Control Consultants

How to Get Started in Statistical Quality Control
F. ALEX GNAEDINGER
Canadian Celanese Limited

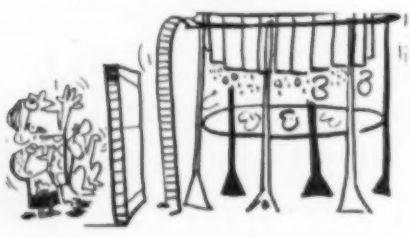
Where and When is Quality Control Applied?
A. J. SPELICH
Waukesha Motor Co.

Operations Research in Marketing
Dr. HERBERT H. JACOBS
Dunlap and Associates, Inc.

Management's Responsibility in a Reliability Program
WILLIAM A. MAC CREHAN
Avionics Quality Control, Bendix Radio Division

How RCA Meets AGREE Test Requirements
PAUL GOLDIN
RCA, Defense Electronic Products

Computer Programming in Multi-Correlation Studies
ROD J. JUVE
Chevrolet Central Office



What's the Difference?
Dr. MASON E. WESCOTT
The Statistics Center, Rutgers-The State University

Practical Applications of Probability Paper
ROBERT CARDNO
Canadian General Electric Co., Ltd.

Classification of Characteristics
BENJAMIN W. MARGUGLIO
The Martin Co.

Subjective Product Evaluation Methods
MISS ELAINE T. ZLOBIK
Research Center, General Foods Corp.

Quality Control Thinking Solves Overall Management Problems
WAYNE BIKLEN
American Safety Razor Co.

Quality Control of Clerical Operations
J. JACK INGRAM
U. S. Department of Commerce, Bureau of the Census

Reliability as a Management Problem
THOMAS A. BUDNE
Statistical Engineering Consultant

Computing Equipment Used for Statistical Studies in the Metals Industry
D. H. W. ALLEN
American Iron & Steel Institute
FRANK G. NORRIS
Wheeling Steel Corp.

Sensory Testing
ROBERT A. BAKER
Laboratories for Research Development, The Franklin Institute

Organizing for Quality and Reliability
WARREN PURCELL
Raytheon Co.

Management of Quality and Reliability
RALPH KUEHN
Institute for Defense Analysis, The Pentagon

TU

Panel—Quality Requirements in Specifications
JACK LANCASTER
AMC Ballistic Missile Center

Effective QC Increases Polaris Reliability
FRANCIS A. GALL
Defense Electronics Division, General Electric Co.

Mechanized Retrival of Scientific Information
VIDA GRACE HILDYARD
Remington Rand Univac

Modern Computers in Quality Control
Dr. MILTON TERRY
Bell Telephone Laboratories

Test Performance Charts
FRED ENNERSON, Jr.
Hughes Aircraft

Improving the Quality of Technical Illustrations
NORMAN E. SALMONS
Audio-Visual Service, Eastman Kodak Co.

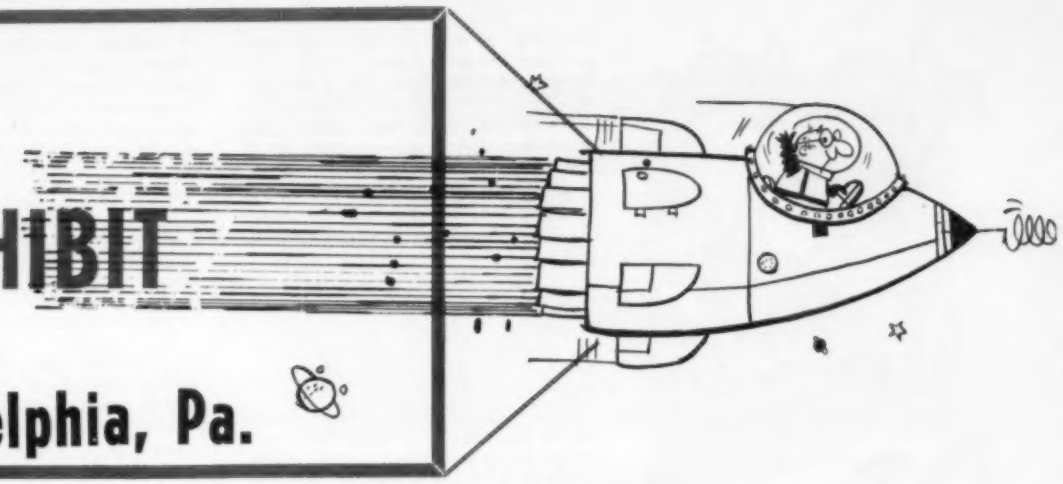
Section Liaison in Professional Development
GORDON THOMPSON
Champion Paper & Fibre Co.

Establishing QC Engineering as a Profession
JOHN G. RUTHERFORD
Lear, Inc.

Statistical Methods for Ceramic Process Control
RICHARD S. BINGHAM, Jr.
The Carborundum Co.

Statistical QC Methods in Telephone Transmission Maintenance
JOHN B. PRINGLE
The Bell Telephone Company of Canada

Don't Be Left Behind, Mark Your Calendar Today! Remember



ND EXHIBIT

, Philadelphia, Pa.

JUNE 5, 6, 7

Y

C and Reliability Organization—Professional pproach
SIGMUND ZOBEL
The Carborundum Co.

ife Testing for Evaluating Reliability
J. ALFRED DAVIES
General Electric Co.

he Purchasing Agent Looks at Quality Control
J. R. McALLISTER
Philco Corp.

coming Inspection and Vendor Relations
FRANK CAPLAN, Jr.
Westinghouse Electric Corp.

quential Analysis
Dr. N. L. JOHNSON
Case Institute of Technology

ep It on the Square
RICHARD De GRAY
The Standard Oil Co.

sual Quality Standards
PETER D. RICE
A. H. Rice Co.

atistical Aids to Visual Inspection
KENNETH DIVERS
General Motors Corp.

nned Training for Total Quality Control
L. N. BRESS
General Electric Co.

e Use of Evolutionary Operations for Study- Processes Common to the Steel Industry
JOHN D. HROMI
U. S. Steel Corp.

ne Simple Statistical Tools for Inventory ntrol
ROBERT D. HEILAND
Kurt Salmon Associates, Inc.

WEDNESDAY

Sampling Plans for Reliability and Life Testing
Prof. HENRY P. GOODE and PROF. KAO
Cornell University

Do You Make These QC Mistakes in Buyer and Seller Relations?
DORIAN SHAININ
Rath & Strong, Inc., Management Consultants

Panel on Training
PAUL C. CLIFFORD
Montclair State Teachers College

An Introduction to Cumulative Sum Charts
H. MACK TRUAX
Atlas Powder Co.

Process Improvement
TRUMAN KOEHLER
American Cyanamid Co.

Solution of a Simple Queuing Problem
GEORGE W. GERSHEFSKI
Standard Oil Co.

Which Road to Satellite Reliability?
RICHARD H. MYERS
The Magnavox Co.

A Contractor Writes a Military Specification
HERBERT B. EPSTEIN
Vought Electronics

Quality Control Progress in Military Procurement of Clothing and Textiles
RENE La BONTE
Military Clothing & Textile Supply Agency

Outlying Observations
R. B. MURPHY
Bell Telephone Laboratories

Quality Control in Research and Development
ROBERT G. FRITZGIBBONS
Raytheon Manufacturing Co.

Controlling Quality in the Production-Engineering Climate
JERRY BRAVERMAN
Frankford Arsenal

Total QC in a Small Business
ALLIN DEACON
Deacon Associates, Quality Control Consultants

Does Small Business Need Quality Control?
EDWARD M. BRABONT
Blackhawk Manufacturing Co.

Variations Flow Analysis for Process Improvement Illustrated from Textile and Other Industries
N. L. ENRICK
Institute of Textile Technology

The Human Equation in Quality Control
Dr. GLENN GILMAN
Lockheed Research Laboratory

Product Performance Assurance
W. J. HUBER
Sperry Gyroscope Co., Division of Sperry Rand Corp.

Statistics Applied to Ultrasonic Welding
MRS. ELIZABETH ROSS
Airoprojects, Inc.

Process and Quality Control for Management
WALTER HAYTER
The Youngstown Sheet & Tube Co.

Maximizing the QC Effort
K. R. WILLHITE
Rocketdyne

A Challenge to Industrial Management
AXEL STERNLOF
Worcester, Mass.

A Successful Program for QC in High Quality High Style Apparel Manufacturing
S. PETER SPALDING
C. F. Hathaway Co.

Myths and Realities in Reliability
CLIFF RYERSON
RCA, Defense Electronic Products

Training for Operations Research and Quality Control
CHESTER H. McCALL, Jr.
Booz-Allen Applied Research

OR Methods in Management
DONALD G. MALCOLM
Operations Research, Inc.

Panel—Practical Applications of Textile Moisture Controls
J. B. CURLEY
American Viscose Corp.

Modern Bayesian Decision Theory and Statistical Quality Control
Dr. MORRIS HAMBURG
University of Pennsylvania

Work Sampling
Prof. WALLACE RICHARDSON
Department of Industrial Engineering, Lehigh University

Mechanical Aspects of Electronic Reliability
H. I. DWYER, Jr.
The Bendix Corp.

Relationship of Reliability and Maintainability to System Effectiveness
RILEY C. HORNE
ARINC Research Corp.

It's QC in the Quaker City in 1961!

ONE MAN BATTLE?

Are you fighting for Quality all alone?

Do your employees think that:

QUALITY is a matter of inspection?

QUALITY is important but not on their jobs?

QUALITY is someone else's responsibility?

If these are some of your plant problems then you will be vitally interested in the Elliott VISUAL QUALITY Program.

ELLIOTT SERVICE COMPANY, INC.
Mount Vernon, New York
(see opposite page →)

drawings or even actual limit samples are necessary to illustrate defects, especially those of a borderline nature. Perhaps a paragraph or two pertaining to this phase of inspection might have been included in the handbook.

Without doubt, this handbook will serve a useful purpose in many cases involving procurement problems.

THE ENGINEERING INDEX, 1959 Edition, Published by The Engineering Index, Inc., 29 West 39th St., New York 18, N.Y., 1600 pages, $70.00.

A New Edition of The Engineering Index published in June 1960 — A guide to the current technological literature of the world for the year 1959 — contains 1600 pages in all. It contains more than 30,000 annotations selected from over 1600 technical publications published worldwide, by a staff of qualified editors who review articles concerning the application of engineering methods and concepts in every phase of the economy — and which are authoritative, current and useful.

The Engineering Index provides the most comprehensive indexing and abstracting service available to engineers who keep informed of the technological developments throughout the world. The information is indexed under two hundred and forty-nine (249) Divisions of engineering. There is available free upon request a complete catalog outlining the coverage of each of these Divisions. Subscription — $70.00 including postage.

In addition to the bound volume, The Engineering Index service includes a card service on library cards which are mailed each week. This service not only provides prompt information (as compared with an annual bound volume) and also gives a subscriber the privilege of selecting only those Divisions in which he is particularly interested.

WORK IMPROVEMENT by Guy C. Close, Jr., John Wiley & Sons, New York, N.Y. 1960, 388 pp. $7.75. Reviewed by Wayland P. Smith, Michigan State University, East Lansing, Michigan.

Written as a practical reference for the individual supervisor, foreman, or businessman interested in the improvement of work, this book provides a clear simple introduction to the methods of work simplification. Although much of this material has appeared before, it has generally been at a more academic level for industrial engineering students. This book would be an excellent text or source of material for a course in work simplification for supervisors.

The techniques of process charting, work sampling, the principles of motion economy and operation charting and their coupling with an understanding of human motivation are all well covered. The examples and illustrations are fresh and clear and cover a wide range of application.

This book is recommended to all supervisors who are concerned with the never ending quest for better methods of doing work and the problems of implementing these changes.

A STATISTICAL MANUAL FOR CHEMISTS by E. L. Bauer, Academic Press, New York, N.Y., pages x-156, 1960, $4.75. Reviewed by Dr. Travis N. T. Olson, Parke, Davis & Co., Detroit, Mich.

This book, according to the author, was written for chemists who perform experiments, make measurements, and interpret data. It would also be useful as a reference or text book for courses in qualitative and quantitative chemistry. Some of the examples, particularly the ones dealing with bias and degrees of freedom on page nine, and colormetric analysis on page 93, would be of value for teaching purposes.

Being a small book, it makes one initially feel that the use of statistics is not difficult. It presupposes no previous knowledge of statistics and only a course in algebra as mathematical background. The author does not profess to discuss the theory of mathematical statistics and uses only a few sentences to describe as much theory as he thinks is necessary. The book deals with specific situations and the statistical methods which will enable an individual to correctly analyze them.

In chapter one, pages 1-12, the author sells statistics to the reader with some of the best illustrations this writer has seen. Chapters two through five, pages 13-84, deal with Comparison of Averages and Experimental Design. Successive examples show how replications and slight changes in design influence the reliability of the result. Sampling and Correlation are discussed in chapters six and seven, pages 85-114. Reference is made to MIL-STD-105 and 414 rather than the development of an original sampling plan. Chapter eight, the Control of Routine Analyses, gives many helpful hints on determining instrumental and experimental error and sensitivity.

The author, throughout the book, uses the range rather than the variance, in order to simplify calculations and make statistical methods easier to use. All of the nine tables, except the F Value Table, deal with the range.

The thought, at times, is not too easy to comprehend. This is due

to an effort to avoid complexity, whereas an extra sentence might have clarified the problem. Repeated references are made to previously presented examples which sometimes makes it confusing for beginners. Some of the sections are almost too brief in their coverage, but this is inherent in a small book.

This book should serve as a primer for those people who are interested in statistical methods, but at present know little about them.

Reference may eventually have to be made to some other statistical book as it may be difficult to apply the specific examples cited to a different type of problem without the aid of some theory.

This is probably the most practical and least theoretical of the books that have been written expressly for the chemist.

HOW TO CHART DATA by Phil Carroll, McGraw-Hill Book Co., New York, N.Y., 1960, pages ix-260, $7.50. Reviewed by A. E. Wylie, Michigan State University, East Lansing, Mich.

This book provides information on charting as a method of analysis of data in work measurement, scheduling, and cost control. This deterministic approach is presented step-by-step in discussion with illustrations.

An introductory chapter explains the approach and the advantages gained by charting. Forms of charting are presented in a chapter with discussion of curves, equations, alignment charts and multivariables data. Standards for curve drawing are given in chapter three. The next three chapters deal with aspects of curves in analysis of time study and planning controls work.

Chapters seven and eight contain discussion and examples of analysis in which equations are used. The discussion includes information on separating variables in time study data.

A discussion of alignment charts is given in chapters nine and ten. This includes techniques of working out scales, handling several variables, and translation.

Further discussion of curves is given in the next three chapters on multiple curves, use of the curve family, and preferred numbers. Constant percent charts are described next.

Chapters 15 through 19 are devoted to detailed discussion of chart making. Setup charts is the subject of a chapter. A final chapter is given on how to utilize charted data.

Overall, six chart forms are presented here in a well-written presentation with unusual detail in illustrations. Original charts to indicate probable profit or loss, resulting from a range of products mix, will be of special interest.

AROUSE INTEREST!

SECURE COOPERATION

EMPLOYEE COOPERATION on Quality begins with adequate exposure of the problem.

EMPLOYEE RESPONSE, however, can range from passive resistance to enthusiastic participation. And the stakes are high!

IT MAKES SENSE then to use all the known power and persuasion of in-plant advertising to move minds in the right direction.

THE ELLIOTT VISUAL QUALITY Program can be of real assistance. Through daily employee contacts at the work level it delivers and redelivers your messages.

ITS MOTIVATING INFLUENCE will be felt throughout the plant and particularly in problem areas.

ROUND THE CLOCK support for your Quality objectives could begin with your request for more detailed information on the coupon below.

ELLIOTT SERVICE COMPANY, INC., Mount Vernon, New York

Elliott Service Company, Inc.
Department 1
Mount Vernon, N. Y.

Please provide me, without obligation, further information and multi-color samples of your Visual Quality Program.

Firm _____

Name _____

Address _____

City _____ Zone _____ State _____

. . . section briefs . . .

Seattle section members, wives, and guests are shown as they toured a Boeing 707 Transport at the Boeing Airplane Co., Seattle, Wash. They also observed the manufacture and assembly of the KC-135 Stratotanker.

ALBANY . . . On Nov. 3, Frank McLaughlin presented "How to Plan for Process Control." Frank is always a most welcome speaker.

Another year has rolled by, and the officers of the Albany section hope you and your families enjoy a pleasant Holiday Season and extend their best wishes for a prosperous and successful New Year.

M. P. Flanagan

AKRON-CANTON . . . The October meeting consisted of a dinner and tour of the Chrysler Corporation Ohio Stampings Plant at Twinsburg, Ohio. This plant is the world's largest and most fully automated stamping plant.

Dr. John C. Whitwell, Princeton University, will discuss Evolutionary Operation at our January meeting. It should be noted that this will be a joint meeting with the Akron chapter of the American Institute of Chemical Engineers.

Bob Archer, education chairman, reports that tentative plans are being made to conduct spring sessions of basic and advanced QC courses.

H. P. Pierce

ALLENTOWN-BETHLEHEM . . . Wednesday, Oct. 12, was a memorable day for section members and guests who attended our meeting. Our speaker was Harold F. Dodge, one of the real pioneers in the application of statistics in industry. Mr. Dodge presented a very enlightening discourse on "Acceptance Sampling — Some Observations." We are very grateful to him for his excellent presentation.

The section has a course on "Introduction to Quality Control," in progress at Muhlenberg College. Sessions are held Monday nights, 7 to 9 p.m. The same course is being presented simultaneously at Albright College, Reading, Pa. Instructors there are members of the recently formed Reading sub-section.

Ken Stephens, Western Electric, Allentown, presented a talk to that group on Oct. 14. He spoke on "Statistical QC in Incoming Inspection."

David F. Roberts

BALTIMORE . . . At the Oct. 18 meeting, H. Ellner, deputy chief, Chemical Corps Materiel Command, Department of the Army, discussed the features of a new handbook involving verification procedures of the government inspector in evaluating the product quality of contractors. His discussion centered on the new DOD QC and Reliability Handbook H109 for validating suppliers' inspection and QC data. The discussion was of particular significance because Mr. Ellner was instrumental in preparing this handbook for the Department of Defense.

To encourage more individual contribution to the growth of this section, Ben Marguglio is canvassing our

members to find out what QC subjects would be most interesting to premeeting discussion groups. This type of program would have tremendous educational benefits in exchange of views and experience. As soon as the poll is reviewed, arrangements will be made to get this program underway.

A. M. Reek

BATTLE CREEK-KALAMAZOO . . . Our annual management night dinner meeting Oct. 20 in Marshall, Mich., was enjoyed by 62 management guests and section members. The topic, "Management Needs QC, Why?" was followed by a question and answer period.

The Jan. 19 meeting at the Upjohn Co., Kalamazoo, Mich., promises to be another good technical session, with Nelson G. Meagley, QC department Continental Aviation and Engineering, speaking on "The Search for Reliability."

Peter F. Koets

BIRMINGHAM . . . The annual QC Conference for 1960 was well attended. Each of the three sponsoring Alabama sections had members present. A program planning meeting for the 1961 Conference has been scheduled for early December. The co-sponsor of these conferences is the University of Alabama, Extension Div.

A. Raeuber

BOSTON . . . On Oct. 18, 25 heard Bob Fitzgibbons, Raytheon Wayland, discuss the "Techniques of Identifying Quality Costs" at the pre-meeting session. About 75 heard Dr. J. D. Fernback, IBM Owego, N.Y., tell of the "Courtship and Marriage," of the QC and reliability functions at his plant as he developed the theme of "Quality Improvement Requires Planning and Cooperation."

Sixty persons, from 23 companies, attended the five lecture series on "Practical Product Reliability Practice" lead by Dorian Shainin of Rath & Strong Inc. The six lecture basic QC series, one of the most popular of the education program, attracted 38 persons.

Excellent comments have been received on the recently published membership brochure.

On. Jan. 9, the seven lecture series on "History and Methods of Measurement," will be held at Wentworth Institute, Boston, Mass., and will include the DoAll Company lecture on "The Story of the Cutting Edge."

On Feb. 9, Louis J. Paddison, director of product test equipment development, will discuss "Specifications, People, and Reliability," at the regular meeting at the MIT Faculty Club.

Merrimac Valley sub-section will have William Grady, Carter's Ink, and Ken Gleason, Gillette Safety Razor Co., as speakers at the December and January meetings respectively.

H. L. Keefe

BUFFALO . . . On Oct. 24, Williamsville Inn, Williamsville, N.Y., Alvin R. Haven, Trico Products Corp., Buffalo, N.Y., section chairman, presented a paper written by Dr. Martin A. Brumbaugh on "Evaluation of Statistical Methods for Management."

Irving Gordon

CHATTANOOGA . . . The October meeting continued our series on basic operations in QC. The speaker was Dick Fisher, Combustion Engineering, who spoke on $\bar{p}$ charts.

John L. Rose, Jr.

CHARLESTON . . . The section had an enjoyable evening visiting local switching facilities for the C & P Telephone Co. Those who attended this plant tour have a better appreciation of the problems of communication in a statistical sense.

On Jan. 19, a technical meeting will cover "Reliability of Laboratory Data."

F. T. Simon

CHICAGO . . . Members of the section were invited to a Nov. 2 meeting of the Chicago chapter of the ASA at the Illinois Bell Dining Room. The featured speaker was Elmo Roper. His topic, "Surveying Public Attitudes Towards Candidates and Issues in an Election Year," was enlightening and enjoyed by all. Many thanks to ASA for their invitation.

Warren Jones of Management Controls, Inc., acted as master of ceremonies at the Friday luncheon meeting at the 15th Midwest Conference. His review of the activity that has transpired since he was chairman of the first Midwest Conference was most interesting.

The following items, "Highlights of Success," appeared in the Chicago section's *Newsletter*, and merits reprinting. The meeting described, of course, was our triple feature Highlights of Success program Sept. 7. Speakers were Henry Becker, American Steel and Wire; Fred Halton, W. Buchroeder and Son; and Fred Trowbridge, Hallicrafter Company.

While Messrs. Halton and Becker gave us valuable insight into their individual professional success as organizers and managers of effective quality control programs, Mr. Trowbridge's presentation dealt with this subject in a more general approach by outlining a number of guiding principles.

As a special bonus to members of the Chicago section, Mr. Trowbridge authorized publication of his prepared text. This permission is in line with the section's renewed policy of providing written reference material based on our program activities. We are especially appreciative of this opportunity because it constitutes proof of the continued dynamic efforts of a man whose earlier activity on behalf of scientific quality control contributed so greatly to the founding of our society and to the development of our section.

John Dittrich

CLEVELAND . . . A large turnout of our members plus guests from the Cleveland section, ASA, were on hand to hear Jack Youden speak at the October meeting.

The January meeting will be new and different. A participation meeting consisting of many round table discussions will be held in place of the regular meeting. Group leaders will start off each group and guide it through the discussion of the member's problems.

Howard O. Schmidt

COLUMBUS . . . On Oct. 9, the tour of Meade Paper was one that will be remembered by the fine turnout of people for a long time to come. It covered the complete operation of the modern paper plant from raw material to finished product. The tour was conducted in small groups and the guides were well versed in the operations. We wish to thank the Meade Paper Company for their hospitality.

On Jan. 18, there will be a joint meeting with the Institute of Radio Engineers Professional Group on reliability and ASQC. Robert Yereance, Sr., electrical engineer, Battelle Memorial Institute, Reliability Engineering, will speak on "Reliability Field Failure Reporting."

George E. Arris

CORNING ELMIRA . . . The October meeting was a joint meeting with the Binghampton section. It was held at the Iron Kettle Inn, Waverly, N.Y. T. R. Bainbridge, assistant superintendent of the Quality and Standards Department, Acetate Yarn Division, Eastman Co., Kingsport, Tenn., discussed a method of evaluating the relative variation introduced by the various steps in sampling and testing a prouct. He illustrated staggered, nested designs which permit savings of one-half of the tests usually required when checking for variables. This was the maiden speech for Mr. Bainbridge for this technique and proved to be a very interesting talk.

The January meeting will be the annual plant tour and will be held Jan. 10 at the plant of Hardinge Bros. in Elmira, N.Y., manufacturers of precision machines and collets.

Richard J. Gibson

EVANSVILLE-OWENSBORO . . . On Oct. 18, the section was host to a joint meeting with the Evansville Chapter of the American Institute of Industrial Engineers at

Hillies in Evansville. J. E. Anderson, milling engineer and statistician for Iklehart Brothers Division, General Foods, was the speaker. His talk on "Practical Applications of Statistical Quality Control," was very enlightening to both groups. This association with the AIIE in its second year promises to be an annual event to which both groups look forward. We find many common interests in our work.

We look forward to an enjoyable evening on Jan. 17, when C. R. Wade, QC director, Whirlpool Corp., will discuss "Machine Capability Process Studies." This topic is a natural interest arouser as we are all looking for better methods to control the capability of the processes with which we work.

W. E. Ver Wayne

DALLAS-FORT WORTH . . . On Oct. 20, C. F. Lewis, Cook Heat Treating Co., Houston, Texas, completed the last leg of his tour of the four Texas sections when he presented a very interesting paper on "Non-Parametric Tests for Significance," to the Dallas-Fort Worth section.

The section met at the Circle C Steakhouse in Grand Prairie. A 30 minute social period preceded the dinner. This was a radical change from previous type meetings which have been held at the Arlington State College in Arlington.

In addition to the principal speaker, one of the local members, R. A. Glover, gave a 15 minute non-technical talk on "Sampling — Beer Can Style."

Section officers were pleased with the response to this new venture in programming. Attendance for this meeting more than doubled that the the previous month.

We are looking forward with keen anticipation to hearing Joseph Bernik's talk on "Nuclear Energy Goes to Work." This should be something new for this part of the country and should attract wide attention.

R. R. Massegee

DAYTON . . . At the first Technical Meeting of the season was presented an interesting paper, "Reliability, Stability and Quality Control," by Paul E. Bruce, manager, Quality Assurance Requirements and Specifications, Lockheed Aircraft Corp., Missile Systems Division, Sunnyvale, Calif., at the auditorium of the National Cash Register Co.

On Oct. 17, the Dayton section educational program was opened with classes at Patterson Co-op School for "Introductory Course in Statistical Control." There were fifty-four registrants.

Harleigh F. Diehl

DENVER . . . On Oct. 8, the section sponsored a clinic that proved that a lot of work is necessary to succeed at a venture of this sort — our first attempt. With 58 participants, eight speakers and five exhibitions by local representatives of national inspection and gaging equipment, the all day meeting covered the starting of a QC program and followed through to successful cost reduction.

On Oct. 29, a plant tour of the Martin Denver plant was a huge success. Our host and section chairman, Ray B. Davis, arranged the tour, with all the aspects of QC demonstrated in the advance of a Titan missile, from start to finish. This was followed by dinner at the Silver Wing and an interesting talk by Mr. Wasmuth, QC manager, Martin Denver. Our return home was through a brief but heavy snowfall. Our season's work is just beginning in the Denver section.

C. E. Ellis

ERIE . . . The Erie section announced a basic training course in QC early in the fall and letters were mailed to industries in this area inviting those who felt a need or interest in the subject to attend. The response was far beyond anything anticipated which has resulted in standing room only at these meetings. Local announcements have been curbed and some requests for attendance have had to be turned down — a rather unique situation for this section.

Invitation to join ASQC will be extended to all nonmembers who have attended this course up to the time of our January meeting, which, without doubt, will double the active membership in this section.

Training classes are being lead by our section chairman J. S. Zahniser of the QC Division of Talon, Inc., and assisted by other qualified members of the group. Attendance has remained above 40.

G. Whitesmith

GREATER DETROIT . . . On Oct. 19, Management Night was sponsored by the Windsor and Greater Detroit sections. A reception for members and guests preceded the dinner at the Prince Edward Hotel in Windsor. One hundred and sixty persons came, of whom 71 were guests. Father Pappert of Assumption University began the meal with a benediction. This was followed by a toast to the Queen and a toast to President Eisenhower. J. A. Anderson, vice president, GMC, said in his talk that QC is the concern and responsibility of management.

L. M. Steward, QC director, AC Sparkplug, discussed the relationship of QC and reliability — the fact that a part or a mechanism must keep on working in many environments for a long time.

Besides these gentlemen, C. G. Bauer, corporate manufacturing staff, Chrysler Corp.; A. Underwood, manager, Manufacturing, Ford-Canada; P. A. Rudge, general manager, General Motors Engine Plant, Windsor; R. Schmalenberg, general manager, Manufacturing, Chrysler, Canada, and officers of the two sponsoring sections were seated at the speakers' table.

Frances D. Huntington

GREATER MUSKEGON . . . Our meeting Oct. 13 was attended by 60 members and management guests. Arch F. Jordan, senior vice president, John Wood Co., gave a very interesting talk on the "Results of the QC System" at his company. Everyone enjoyed the club steak dinner. Several pictures were taken of the group for our scrap book.

Our meeting Jan. 12 will be a joint meeting with the Grand Rapids section. We will have a plant tour of the Lear Corp.

Our Annual Ladies Night will be held Feb. 9 at the Black Angus Steak House. Charles Anderson, vice president, Davenport Institute, Grand Rapids, Mich., will be the feature speaker.

Our intermediate QC course will be opened Jan. 9 and will continue for seven weeks.

William A. Hume

HAMILTON-MIDDLETOWN . . . On. Jan. 4, the meeting will open with a cocktail half hour at 6:30 p.m., in the Driftwood Room of the Sports Bowl, Middletown, O.

James B. Harrison, Wright-Patterson AFB, Dayton, Ohio, will speak on "Effective Measurement of Quality Costs." The cost of turning out a product to meet any given standard does not depend alone upon incoming materials or the workmanship expended upon the product. Nor can the cost of quality be determined simply by adding in expense relative to inspection. Rather, it must be extended to all phases affecting quality and include specifically an integrated QC program.

A member of SAE, ASME, and the Dayton section, ASQC, Mr. Harrison has been with Bettis Atomic Power Division of Westinghouse, Cummins Engine Co., and the Allison Division of GMC before joining the School of Logistics at Ohio State University. He is currently on assignment as course director, QC, Wright-Patterson AFB. A graduate of Purdue University in mechanical engineering and statistical methods, and with his experience in QC, production design and analytical engineering, he has been in a position to know and understand the problems involved in measuring quality costs.

Lon Ely

HAMILTON, ONTARIO . . . In spite of having to run opposition to Messrs. Kennedy and Nixon, our October meeting was one of the best held for some time, both

NEW AMERICAN STANDARDS

The work of the Standards Committee of ASQC has resulted in the revision of several American War Standards (Z1.1-1941, Z1.2-1941, Z1.3-1942). These war standards have been revised, rehashed, and revised again. ASQC circulated these revised standards in a survey of organizations having a substantial interest in quality control. After further review of the war standards, in light of knowledge gained from the survey of industry, ASQC submitted the standards to the American Standards Association for approval as American Standards. The American Standards Association approved the standards as American Standards on November 21, 1958. . .

. . . and now they are available for you!

ASQS Standard B1-1958, "Guide for Quality Control"

ASQC Standard B2-1958, "Control Chart Method of Analyzing Data"

These are revisions of AWS Z1.1, Z1.2-1941, and have been approved as ASA Z1.1, Z1.2-1958.

Available in 28-page covered volume.....$2.25

ASQC Standard B3-1958, "Control Chart Method of Control Quality During Production"

This is a revision of AWS Z1.3-1942, and has been approved as ASA Z1.3-1958.

Available in 36-page covered volume $2.50

MAIL COUPON TODAY!

ASQC, 161 West Wisconsin Avenue 1-61
Milwaukee 3, Wisconsin

Please send me the following:

....copies, ASQC Standard B1-1958, B2-1958 (ASA Standard Z1.1, Z1.2-1958) @ $2.25 per copy

....copies, ASQC Standard B3-1958 (ASA Standard Z1.3-1958) @ $2.50 per copy

Enclosed is ..... amount to cover the above order.

Name.....

Address.....

City..... **Zone**.... **State**.....

Make all checks payable to American Society for Quality Control, Inc.

from the standpoint of interest shown and subject presentation. William Edgley, manager, Manufacturing Development, Canadian General Electric Co., Toronto, Ontario, covered our early introduction to QC, the present status of QC; its responsibilities and relations to other segments of the organization; and, its responsibility in the immediate future. He "built up" an organization and indicated some of the ways management can support its quality control functions. A very lively question and answer period followed.

On Jan. 12, we are meeting jointly with the Canadian Industrial Management Association and the Engineering Institute of Canada. We are looking forward to hearing W. A. MacCrehan, manager, Avionics Quality Control, The Bendix Corp., Baltimore, Md., who is no stranger to many of us. The meeting promises to be interesting and enlightening.

Oliver W. Holland

HARRISBURG . . . Our Oct. 5 dinner meeting was held at Castigilia's Restaurant in Harrisburg. Ervin Taylor, Martin Co., conducted a workshop and chose his paper "Frequency Distribution Analysis Sheet," as the topic for his discussion. A good deal of interest was shown by both members and guests in the use of this QC tool.

On Jan. 4, Fred C. Gropper, engineering services, E. I. DuPont Co., Wilmington, Del., will be the guest speaker at the joint meeting of the section with the American Chemical Society. The subject of his discourse will be "Operation Research." The dinner meeting will be held at the Arcadia Cafe, W. Orange St., Lancaster, Pa. This will be a very interesting and timely subject for both groups and their guests.

On Feb. 1, the dinner meeting will be a panel discussion on "Selling QC to Management." It will be held at the VFW, York, Pa. This should prove to be a very interesting meeting as the panelists will be local members from several of the industrial plants in the area.

Ann Englehart

Technometrics

the journal of statistics for the physical, chemical and engineering sciences

Make it a part of YOUR technical library

co-sponsored and published quarterly by ASQC and ASA

Table of Contents, Vol. 2, No. 4, November, 1960

Conclusions vs. Decisions, J. W. TUKEY

Statistical Life Test Acceptance Procedures, BENJAMIN EPSTEIN

Estimation from Life Test Data, BENJAMIN EPSTEIN

Some New Three Level Designs for the Study of Quantitative Variables, G. E. P. BOX and D. W. BEHNKEN

Graphical Procedure for Fitting the Best Line to a Set of Points, J. L. DOLBY

Tables of Tolerance-Limit Factors for Normal Distributions, ALFRED WEISSBERG and GLENN H. BEATTY

On the Evaluation of the Negative Binomial Distribution with Examples, G. P. PATIL

On Methods of Constructing Sets of Mutually Orthogonal Latin Squares Using a Computer, R. C. BOSE, I. M. CHAKRAVARTI and D. E. KNUTH

HERE'S HOW TO ORDER YOUR SUBSCRIPTION

ASQC members—$6.00 per year; non-members, libraries, etc.—$8.00 per year (ASA members may subscribe through their national office for $6.00 per year).

Send check or money order payable to TECHNOMETRICS, A Journal of Statistics for the Physical, Chemical, and Engineering Sciences, Box 587, Benjamin Franklin Station, Washington 4, D.C.

WHY NOT SEND YOURS IN TODAY?

HARTFORD . . . The section will sponsor a One Day Seminar Jan. 26 at the Hotel Bond in Hartford. Dorian Shainin, ASQC Fellow, vice president of Rath and Strong, Industrial Consultants, will describe "13 Ways to Reduce Inherent Avoidable Costs." For further information, contact C. Chilone, Anemostat Corporation of America, 15 Frower St., Hartford, Conn.

L. Sezpaniak

HUNTSVILLE . . . The annual QC Conference was held at the University of Alabama on Oct. 13-14. There were two sections in the Conference, a basic and an advanced. The basic section was intended for those persons who were new to the QC field and the advanced for those who have been in QC for some time.

The Huntsville section is looking forward to hearing our ASQC president speak this month. For most of us, it will be our first opportunity to meet J. Y. McClure.

Barry E. Davis

STATE UNIVERSITY OF IOWA . . . A method of establishing performance capabilities of new machines was described by Irwin A. DeGrote in a talk before a joint meeting of the Iowa section and the Tri-City Chapter of the American Society of Tool and Manufacturing Engineers Oct. 12, at Moline, Ill. Mr. DeGrote, Ford Motor Co., presented control techniques which he has used successfully in assuring that new machines would produce parts for a new product prior to initiating full scale production.

E. B. Godsey

KANKAKEE-JOLIET . . . On Oct. 10, at a dinner meeting at Mickelberry's Highway Inn, Chicago Heights, Ill., the section heard an address by Dr. George McNelly on "Psychological Implications of QC." Dr. McNelly, who is a supervisor in the galvanizing department, Indiana Harbor plant, Inland Steel, and also teaches classes at Purdue University Extension Division in Hammond, Ind. He received his PhD in Industrial Psychology from Purdue University. In his talk, he stressed the importance of proposed QC programs being presented to shop personnel in a very basic, easily understood, form so that the persons involved in manufacturing the product feel they are really a part of the program.

On Jan. 10, the section will meet at Chicago Heights, Ill., for a dinner meeting and a presentation entitled "EVOP and Office Machines," to be given by Mrs. Florence Pohley Ritz of the Simoniz Co.

John E. Rauworth

KANSAS CITY . . . A most interesting and illuminating panel discussion was held by the Kansas City section Thursday night, Oct. 20. The subject was "What We Expect of Quality Control." Participating were Ray Smith, Wilcox Electric, with "Engineering"; J. K. Reynolds, Bendix Corp., with "Purchasing"; and Arlo Hoover, Vendo, with "Manufacturing." The panel was moderated by John B. Cobb, Standard Oil. The unusual approach plus a larger than usual attendance evoked a considerable amount of audience participation.

Afton Taylor

LIMA . . . E. L. Byrkett, manager, Gage & Inspection section, Sheffield Gage Co., Dayton, Ohio, was the speaker for the Oct. 11 Annual Management Night Dinner Meeting at the Barr Hotel. Mr. Brykett's subject was "What Management Expects from QC & What QC Can Offer Management."

Our management heads were well represented and were introduced to the members and guests in attendance.

The section will hold its Jan. 10 meeting at Superior Tube Co., Wapakoneta, Ohio. Meeting time 7:30 p.m. A skit written by Miss Bonnie B. Small will be directed by D. C. Fultz, senior analyst, Ford Motor Co., at this meeting. The production was highly recommended by Mr. Sagen of Abbott Laboratories, Chicago, Ill., and should be of great interest to all in attendance.

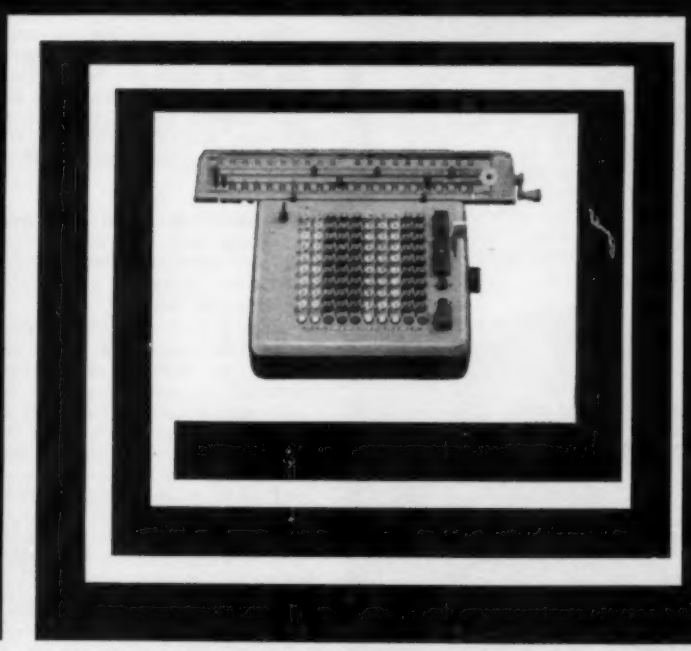
E. K. Anderson

NEW—*Another Achievement from Monroe*

Never before has so much calculator function been compacted into so small a unit. Or so low a price. This is LA-9, the newest, the ultimate in Monroe's famous L line calculators. This one's honored antecedents today are accomplishing their time and money saving missions on more desks in American business than any other calculator. LA-9 covers less area than a letterhead sheet, weighs less than 18 pounds. Yet this new compact automatically performs many of the jobs that much bigger and costlier machines do. Its peak performance is guaranteed and maintained by Monroe's nationwide service organization. And at so moderate a price, it can quickly pay for itself through its efficiencies.

for CALCULATING · ADDING · ACCOUNTING · DATA PROCESSING MACHINES

See the MAN from MONROE



Monroe Calculating Machine Company, Inc. Sales and service in principal cities everywhere. General offices, Orange, N. J.

A DIVISION OF LITTON INDUSTRIES

LOS ANGELES . . . The Lockheed panel headed by H. C. Christen, QC director, attracted 347 persons. A. L. Altunian covered Lockheed Vendor Evaluation program while Carl Haddon, vice president and general manager, expressed his viewpoint on how the QC problem is justified; its need and basic goals of operation.

On Jan. 24, the Hughes panel will be headed by P. J. Mallen, director of reliability and QC. Dr. N. I. Hall, vice president, engineering and reliability, will be the spotlight speaker. His topic is "Looking Toward the Future of Reliability and Quality." J. J. Tamsen, QC manager, will be the guest speaker and will speak on "Videosonic Instructions Raise Quality Standards."

S. Kozich

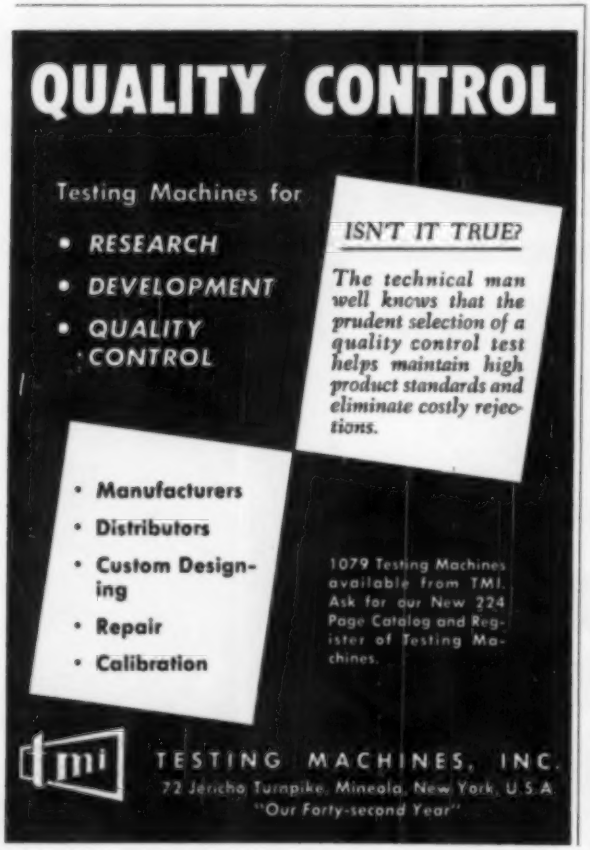
LOUISVILLE . . . Section members met at the Provincial House for a dinner meeting Oct. 10. This was the annual Management Night meeting and 97 members and guests were present. Dr. A. V. Feigenbaum, General Electric Co. spoke on "Total Quality Control."

Carroll R. Ferguson

MEMPHIS . . . Roger W. Anderson, manager of the Medium Power Quality Assurance in the Semi-Conductor Division, Texas Instrument Co., Dallas, Texas, was the speaker at the meeting Oct. 18 at the Memphis State University Library. Mr. Anderson gave a very interesting program on "Three Applications of Analytical Techniques and Experimental Design."

J. Y. McClure, Convair Division, General Dynamics Corp., Fort Worth, Texas, and President, ASQC, will be the featured speaker at our dinner meeting 6:30 p.m. Jan. 17, at the Memphis Athletic Club. His topic will be "Quality Control — A Production Necessity." All members are urged to be present.

W. Lee Dickerson


QUALITY CONTROL
Testing Machines for
• RESEARCH
• DEVELOPMENT
• QUALITY CONTROL
ISN'T IT TRUE?
The technical man well knows that the prudent selection of a quality control test helps maintain high product standards and eliminate costly rejections.
• Manufacturers
• Distributors
• Custom Designing
• Repair
• Calibration
1079 Testing Machines available from TMI. Ask for our New 224 Page Catalog and Register of Testing Machines.
tmi
TESTING MACHINES, INC.
72 Jericho Turnpike, Mineola, New York, U.S.A.
"Our Forty-second Year"

METROPOLITAN . . . The turnout of 154 members and guests at the October Buzz Session on In-Plant Quality Training necessitated a last minute change to the Shelburne Roof Garden. The lively, one hour discussion, precipitated by an excellent illustrated "kick-off" presentation by Leon Bress, General Electric Co., revealed a high level of interest in the practice of in-plant education and training. Meeting chairman Conrad Hohing, Jr., and his 12 table chairmen are to be commended for their lively, well-run meeting.

The chairman of the Seton Hall University Chemical Conference, Louis Pasteelnick, advises that the event will consist of three panels — a sampling of elementary ideas in statistics; computer applications, analog and digital, and experimental design. Speakers include Dr. Churchill Eisenhart and Dr. J. Youden, National Bureau of Standards; Dr. Ellis R. Ott and Dr. Mason E. Wescott, Rutgers — The State University; Dr. Grant Wernimont, Eastman Kodak Co., and Consultants Cuthbert Daniel and Tom Budne.

Stephen G. Orban

MID-HUDSON . . . On Oct. 4, members and guests toured the E. I. duPont de Nemours Corp., Newburgh, N.Y. Twelve employees of the plant conducted 37 members and 23 guests through the Fabric Division to observe the type of controls necessary in this type of industry. Mrs. Joseph G. Czinkota of the DuPont plant and a section member, made all the arrangements for this interesting program.

F. J. Sindelar, quality manager, IBM, Poughkeepsie, N.Y., moderated a panel discussion at the regular meeting Nov. 1. Panel members were James Penrose, division manager, IBM, Kingston; Quito Recchia, DeLaval Separator Co.; William Cranston, quality manager, Western Printing and Lithographing Corp., and Louis Bock, quality manager, Daystrom Electric Corp. The subject was "Why Quality Engineering?"

E. L. Leadbitter

MILWAUKEE . . . The meeting Oct. 17, held at the Milwaukee Inn, featured W. A. Golomski, vice president, H. J. Mayer & Sons Co., Inc., Chicago, Ill. The 75 members and guests evidenced their enjoyment and appreciation of "The Concept of Distribution," and its usefulness in production by their participation in the question and answer period.

The dinner meeting was preceded by the first education and training session for the year. These sessions are being arranged by R. Brundle of the Larry Hammond Co. The attendance of 65 persons at the education and training session, which was devoted to "The Fundamentals and Mechanics of Gaging," indicated a high level of interest in this phase of quality control.

Darrell Schroeder

MINNESOTA. . . A good meal and congenial bar attendants (our own members) helped the vote at the October meeting to be in favor of Holiday Lodge as our permanent meeting place — so now we have a place we can call home!

Fred C. Leone of Case Institute directed our thinking to re-evaluating the value of significance tests as a "sure fire" method of saving dollars. Through a brief description and illustration of the method he and a colleague described in detail in the June, 1957, issue of IQC, Mr. Leone pointed out the fact that further study of a situation often proved that the amount of significant difference that exists does not preclude that money will be saved by changing methods or procedures. Use of Mr. Leone's method will show one of two things — that the significance found might result in a saving, and is worth further investigation, or the subject might as well be dropped.

Violet M. Rice

MONTREAL . . . The section's Fourth Annual All Day Quality Control Forum was held Oct. 22 at the Ecole Polytechnique in Montreal. The attendance of 269

Stock List

ASQC PUBLICATIONS

Publication	Price
INDUSTRIAL QUALITY CONTROL	
Vols. XIV, XV, XVI (July, 1957—June, 1960) .....Each Vol.	10.00
Individual Back Issues	1.00
(1) Index to Vols. I-X	.50
(2) Index to Vols. XI-XV	1.00
ASQC STANDARD SERIES	
(6) A1-1951 "Definitions and Symbols for Control Charts"	.50
(7) A2-1957 "Definitions and Symbols for Acceptance Sampling by Attributes"	.50
(8) B1, B2-1958 "Guide for Quality Control and Control Chart Method of Analyzing Data" (ASA Standard Z1.1, 1.2-1958)	2.25
(9) B3-1958 "Control Chart Method of Controlling Quality During Production" (ASA Standard Z1.3-1958)	2.50
GENERAL PUBLICATIONS SERIES	
(11) General Publication No. 2, "Manual for Authors of Technical Papers for Publication in Industrial Quality Control"	
(12) General Publication No. 3, "Span Plan Method of Process Capability Analysis"	2.50
(13) General Publication No. 4, "The Power to Detect a Single Slippage and the Probability of a Type 1 Error for the Upper Three-Sigma Limit Control Chart for Fraction Defective, No Standard Given"	2.50
CONVENTION TRANSACTIONS	
(23) Thirteenth Annual Convention "Quality Control Convention Transactions, 1959"	3.50
(24) Fourteenth Annual Convention "Quality Control Convention Transactions, 1960"	5.00
CONFERENCE PROCEEDINGS	
(48) Fourteenth Midwest Quality Control Conference Proceedings, 1959	3.00
(49) Second National Automotive Division Conference Transactions, 1959	2.00
(50) Third National Automotive Division Conference Transactions, 1960	2.00
Second and Third Automotive Division Conference Transactions, when purchased at same time	**3.00**
(51) Third Annual Chemical Division Conference Transactions, 1959	2.50

Publication	Price
MISCELLANEOUS	
(76) ASTM Manual on Quality Control of Materials	2.50
(79) NSMPA Manual on Statistical Quality Control Volume 1, "What and Why"	1.50
(80) NSMPA Manual on Quality Control Sampling Volume 11, "Highway Markers to Better Quality"	1.50
(81) NSMPA Manual on Sampling Inspection Volume III, "Do It Yourself Sampling Inspection Installation"	1.50
NSMPA Manuals, Vols. I-III, when purchased at same time	**4.25**
(83) Charles R. Hicks, "Fundamentals of Analysis of Variance," Reprint from IQC Vol. XIII, Nos. 2, 3, 4, August, September, October, 1956	.50
(87) Ralph Allan Bradley, "Determination of Optimum Operating Conditions by Experimental Methods —Part I," Reprint from IQC Vol. XV, No. 1, July, 1958	.15
(88) J. Stuart Hunter, "Determination of Optimum Operating Conditions by Experimental Methods —Part II," Reprint from IQC Vol. XV, No. 6, 7, 8, December, 1958, January, February, 1959	.75
(89) Thomas A. Budne, "Random Balance," Reprint from IQC Vol. XV, No. 10, 11, 12, April, May, June, 1959	.25
(90) Ervin F. Taylor, "File It To Find It . . . the ASQC Literature Classification System," Reprint from IQC Vol. XVI, No. 3, September, 1959	.25
(91) Paul C. Clifford, "Control Charts Without Calculations," Reprint from IQC Vol. XV, No. 11, May 1959	.25
(92) Case Histories on Statistical Methods for Quality Control, by Metals Technical Committee, Series II	1.00
(93) Quality Control Methods and Management Symposium Transactions, 1958, Drexel Institute	2.00
(94) Quality Control Methods and Management Symposium Transactions, 1959, Temple University	2.00

AMERICAN SOCIETY FOR QUALITY CONTROL
161 W. WISCONSIN AVE.
MILWAUKEE 3, WIS.

Date .....

Please send me the copies of ASQC Publications which I have checked below in quantity as indicated. Enclosed is a check or money order for ..... **(Remittance must accompany orders less than $5.00. Postage is added to orders not accompanied by a remittance.)**

Back Volumes IQC (specify) ..... **Back Issues IQC** .....

(1)	(11)	(49)	(80)	(89) .....
(2)	(12)	(50)	(81)	(90) .....
(6)	(13)	(51)	(83)	(91) .....
(7)	(23)	(76)	(87)	(92) .....
(8)	(24)	(79)	(88)	(93) .....
(9)	(48)			(94) .....

Name .....
(please print or type)

Address .....

Company .....

City ..... **Zone** ..... **State** .....

Make remittance payable to the American Society for Quality Control, Inc.

Special bulk order discount on any numbered items: 10% for 10 or more copies; 25% for 50 or more copies.
New service for individual ASQC members only—20% discount on all numbered publications in any quantity.

showed a continuation of the steady annual increase. The Forum was divided into four sections — basic concepts, measurement concepts, advanced methods, and management. These sections covered such topics as control laboratory measurements, design of experiments, gauging problems, quality assurance, quality costs, management aspects of reliability and quality control sampling problems and tests of significance.

The luncheon speaker, S. M. Finlayson, Canadian Marconi Co., gave an extremely interesting and topical address on "The Impact of Foreign Competition on Canada's economy."

The Forum theme was "The Control of Quality," vital to sound business.

On Jan. 11, R. L. Myers, Westinghouse Electric Corp., Elmira, N.Y., will discuss "Quality Control System in a Factory." Mr. Myers is chairman of the Corning-Elmira ASQC section.

On Feb. 8, D. W. Guthrie, Dominion Rubber, Montreal, Quebec, will outline a "Commonsense Organization for Applied Industrial Statistical Quality Control." Mr. Guthrie is a former chairman of the Montreal section.

T. F. Waterston

MUNCIE . . . Section members thoroughly enjoyed the plant tour of the new Fisher Body Plant at Marion, Ind., for the October meeting. Members are still talking about the mammoth presses required to stamp out automobile tops, doors, deck lids, etc.

Kingsley Forry, Owens-Illinois Glass Co., Toledo, Ohio, will be our guest speaker Jan. 19. His topic will be "Processing Statistical Data Through the IBM."

C. B. Johnson

NORTHEAST TENNESSEE . . . The sixteenth general membership meeting was held at the Peerless Steak House in Johnson City, Tenn. The continuing pre-session clinic strated at 6 p.m. Joe Johnston, section chairman, spoke on "QC as a Management Tool." This was the second in a series of talks on QC Management.

After dinner, Douglas H. W. Allan, metallurgical statistical analyst, American Iron and Steel Institute, spoke on "Developing Industrial Standards by Statistical Methods." The sessions were attended by 32 members and 16 guests.

The section's education committee has arranged for evening courses in Kingsport and Bristol, Tenn. "Evolutionary Operations," is being presented at Kingsport and "Industrial Statistics," is being conducted in Bristol. Further plans for more advanced courses in statistics are being made with East Tennessee State College.

M. Gomez

OMAHA-LINCOLN . . . On Oct. 14, the section was the guest of Store Kraft Manufacturing Co., Beatrice, Nebr. Following a complimentary dinner and short introductory talk by Bernard King, QC manager, Store-Kraft, a tour of the plant demonstrated the manufacture of store fixtures for chain dime stores and ladies ready-to-wear goods from coast to coast as well as custom items for stores.

T. C. Anker

OKLAHOMA CITY . . . James Quigg, Lily Tulip Corp., delivered a resourceful speech on "Production Quality Relationship" at the October meeting.

"How You Can Make a Multi-Plant QC Program Work," will be H. O. Hehner's topic at the January meeting. Our thanks to Mr. Hehner and Monsanto Chem.

B. J. Carson

PARKERSBURG . . . Section members heard a delightful talk Oct. 19 by E. J. Delate, E. I. duPont Co., Wilmington, Dela. His subject was "Resampling in a Chemical Process." At the start of the meeting members viewed an educational short movie.

The idea of showing a short movie at the start of each meeting was suggested as a means of generating interest. Results so far are good.

The section is currently sponsoring a course in basic Quality Control.

Robert R. Stewart

PENSACOLA-MOBILE . . . Sam Carrell, quality assurance manager, Germanium Products, Texas Instruments, addressed the section on "Training QC Inspectors and Engineers," at the October meeting. Mr. Carrell's talk was very well received and presented aspects of training that were beneficial to all in attendance. We were pleased to see some of our members from the Masonite Corp., Laurel, Miss., who didn't let a round trip drive of 250 miles prevent their attendance.

Walter D. Nencka

PHILADELPHIA . . . The October meeting was an outstanding one with vice president S. N. Lev of RCA who delivered a timely talk on "Quality, Reliability plus Teamwork." He stressed the importance of the integration of reliability and also warned the group that cynics should not discourage the progress of quality control. Mr. Lev also requested the help of ASQC as other top management speakers have done in the past. His talk was supplemented by a fine color movie of the BMEWS warning system developed and constructed by RCA as the prime contractor.

Technical sessions conducted by Pete Graziano of SKF Industries, Inc., and Glenn Johnson of Jonkers Business Machines, Inc. were very practical and a good exchange of ideas were brought forth by questions and comments.

Jules Mehalek, chairman of the Philadelphia committee for the National Convention 1961 held a meeting on October 8, 1960. Regular meetings will be held in the future and your reporter knows first hand that many plans are being worked on to make the coming convention the best yet.

Albert G. Dettore

Could an

E-X-P-A-N-D-I-N-G PLUG GAGE

solve a gaging problem for you?

The Comtorplug expansion principle is unique . . . and proven. Hundreds of U. S. precision-production programs use it, including several of the very largest. The unique expansion plug gives true 2-point gaging. You see actual diameter in a fixed reading to fraction of .0001". You measure front or back taper exactly, also ovality, bell mouth, etc. Centering, alignment and pressure are automatic, allowing accurate use by all types of personnel.

For holes ⅛" to 10" dia.

If you produce precision holes in volume

SEND FOR BULLETIN 50

COMTOR COMPANY, 80 Farwell St., Waltham 54, Mass.

COMTORPLUG

PITTSBURGH . . . On October 25, 1960, a most interesting plant tour was conducted by personnel of the Zinc Smelting Division of the St. Joseph Lead Co. All operations were viewed from the receipt of ore through the roasting and smelting operations to the final product. The high degree of automation, and the exacting requirements for high quality in the final product were most impressive. The "by-product" aspect of the operation were also noteworthy because of the amount of interrelated controls necessary to keep both the prime product and the by-products at a high level of quality. In addition, we were most happy to have two guests join with our Section on the tour.

Looking ahead on our schedule, we see that in January H. W. Clatworthy, Bettis Atomic Power Division, Westinghouse Electric Corp., is to speak about "Incomplete Block Diagrams." From time to time our members have asked for more information on designed experiments. Therefore, we are expecting a large turnout to hear the discussion on this topic.

Chester R. Smith

PITTSFIELD . . . The section sponsored an All Day Workshop Seminar on Sampling and OC Curves on Oct. 13. Dr. Mason E. Wescott, a nationally known consultant and director of in-plant training programs, was guest speaker.

Using MIL-STD-105A and -414, he showed us how to develop OC curves and what they mean. He showed us the fallacy of using a certain percent AQL inspection and expecting to get that percent good all of the time. We were introduced to the Dodge-Romig Inspection Tables, their use, and what to expect from them.

Dr. Wescott conducted an excellent meeting and imparted to us a vast amount of information in a very short time.

In attendance were 46 for the afternoon session and 43 for dinner and the evening session.

Howard J. Greenslet

PORTLAND . . . At the last regular meeting, it was announced that Henry Blood of Omark Industries is going to start a one-half hour educational series which will be presented at each of the regular meetings for the rest of the season. Motion pictures are being taken of the highlights of each of our regular meetings. The best portions of the films will be edited and combined for a complete showing at our social meeting in June. Pat Jones and Aldean Keys have been appointed co-chairmen of the social meeting, which is being planned as a dinner-dance event.

A One Day Workshop is being planned for April or May, with definite plans to be announced later.

George Mickel

RHODE ISLAND . . . The section was well represented at the New England QC Conference Oct. 20-21 in Worcester, Mass. Shaw Goldthwait, Colyer Insulated Wire Corp., was one of the advisers for this conference.

Robert Rumazza, General Electric Co., our education chairman, will start a second 15 week course in advanced QC and management the first week in February. This course is sponsored jointly by the Rhode Island ASQC section and the University of Rhode Island.

Paul K. Moffat

ROCHESTER . . . At the October meeting, Lawrence Congdon, Semi-Conductor Division, Texas Instruments Inc., spoke on "Reliability in the Semi-Conductor Industry."

Plans are underway for the All Day Spring Clinic, which once again will be held at the University of Rochester.

The Rochester section has agreed to continue their support to the Public Library by continuing the magazine subscriptions and by increasing the current store of books on QC.

Al Rickmers

ST. CHARLES . . . The October meeting was well attended and the group enjoyed a talk given by Ernest H. Weinwurm of De Paul University. Dr. Weinwurm, management consultant and educator, described the manner in which management looked at quality control. He noted that QC has a responsibility to correctly bring to managements' attention all existing problems.

The January meeting will be Ladies' Night. A very interesting program will be presented by Frank McLaughlin, General Electric Co. He will explain the job of QC to the ladies — with emphasis on the professional stature and growth of QC.

Ellis Elder

SAN ANTONIO . . . The second monthly meeting was held Oct. 18 at the Granata Hotel. It was preceded by a social and cocktail hour. C. F. Lewis, metallurgical engineer, Cook Heat Treating Co., Houston, Texas, spoke on "Non-Parametric Tests." The topic was well received in view of the numerous interruptions during his presentation by those who questioned the validity of such tests. All in all, everyone emerged from the meeting with a new view on using such methods of testing.

The section is looking forward to the meeting Jan. 17, which is both Ladies' Night and Bring the Boss Night. We feel that Mr. Bernik's paper on Nuclear Energy will be most interesting to everyone.

R. W. Worrick

SAN BERNARDINO . . . The Annual Inland Empire One Day Conference will be sponsored by the section Jan. 28 at the Mission Inn, Riverside, Calif. Four simultaneous sessions will be conducted on reliability, advanced statistical methods, process control and inspection workshop. For additional information, see "Clinics, Conferences, and Courses," page 55, this issue.

Gene A. Williams

SAN FRANCISCO . . . Dr. A. W. Wortham, Texas Instruments, Inc., demonstrated at the October Meeting a simple and powerful statistical tool for evaluating quality control costs.

He developed formulas and applied them to quality cost problems, emphasizing the balance between quality, costs, and profit.

The Jan. 9 plant tour of Hewlett Packard Company might well be the high spot of the year for the Bay area section. This company has grown from a one product electronic instrument manufacturer to an organization which employs 1800 people, and now produces more than 300 high quality basic test instruments.

The tour through the $4.5 million new plant will give the section an opportunity to observe the very latest techniques in the manufacture and control of electronic equipment.

M. R. Hubbard

SANTA MARIA-VANDENBERG . . . Gene Sullivan, section chairman, and Tom Russell, past chairman, sent their wives to Disneyland Oct. 16 while they attended the District section chairmen's meeting at the Disneyland Hotel. The plans for the forthcoming Western Region Conference were discussed. J. Y. McClure, ASQC president, was our honored guest. He spoke on present and future activities of ASQC.

On Oct. 25, after a short business meeting and a fine dinner at the Santa Maria Club, 25 members and guests enjoyed a plant tour of the Union Oil Co., Orcutt, Calif.

We expect our February meeting to be quite novel. Bob Andersen says he intends to introduce his two world famous QC engineers, "Hap-Pea" and "Pea Wee." For the past 37 years this pair has monitored the quality of Andersen's foods and soups.

E. P. Sullivan

Your copy of the 1960 Annual Convention Transactions is waiting for you!

If you were unable to attend this year's convention, you won't want to miss the opportunity of obtaining the vast amount of technical information presented. A limited number of copies of the convention transactions are available on a "first come — first serve" basis. Keep your quality control library up-to-date. Order your copy today!

HERE IS A LIST OF THE PAPERS CONTAINED IN THE 1960 CONVENTION TRANSACTIONS

- A Short Survey of Management's Use of Operations Research
- Weapons System Management for Quality
- The Measurement and Specification of Product Abilities
- When is a Small Sample Large Enough?
- How to Plan and Implement an Incoming Material Control Program
- Statistical Quality Control Applications in the Food Industry
- Raising Productivity of Indian Industry Through Quality Control
- Calibration Requirements for Government Contractors
- Videosonic Instructions Raise Quality Standards
- Audit Testing
- Variations of Mechanical Properties in Aluminum Products
- Air Force Quality Control 1960-1962
  Army Progress in Quality Control for 1959
  Navy Progress in Quality Control for 1959
- Integrated SQC in Food Processing
- Some Statistical Concepts Applied to the Navy Calibration Program
- Higher Quality—Through—People in Quality—Quality in People
- An Approach to a Reliability Prediction Program
- Reliability Assurance Provisions in Specifications
- Power Characteristics of Control Charts
- Life Test—Some Practical Considerations
- Good Enough—Isn't Good Enough
- Some Economic Aspects of Quality Standards
- Quality Control Programs Should Be Cost Reduction Programs
- Mechanization, Quality Control and Automation
- Company Standards and Quality Control
- Automatic Production Recording—Yield—And Quality Control
- Sampling Frozen Beef Using a Variable Sampling Plan for Percent Fat
- Selection of Flavor Panels for Complex Flavor Difference
- How Many Dollars are There in Incoming Inspection Costs?
- Total Quality Control Through Reliability
- Progress in Professionalism
- The Analysis of Variations for Certain Physical Properties of Combed Cotton Yarns
- Sampling Problems in the Metals Industry
  How Shall We Apply It?
  Sampling Problems in the Metal Industries
- Statistical Evaluation
- A Program for Defining and Controlling Visual Defects in a Multi-Plant Operation
- Reliability in Communications and Administrative Applications
- 50,000 Partners

All This is Yours ... and the price – just $5.00 per copy

This year, for the first time –

Reprints of individual papers are available at only $.50 each. To order, encircle titles and indicate the quantity desired in the margin.

ASQC, 161 W. Wisconsin Ave. 1-61
Milwaukee 3, Wis.

Send me ..... copies of the 1960 Annual Convention Transactions at $5.00 per copy.

Send me ..... reprints of individual papers, as encircled, at $.50 each. I have indicated the quantity desired in the margin.

Amount ..... enclosed.

Name.....

Address.....

.....

ASQC members are entitled to a 20% discount.

Progress with the Society and the field of quality control by enlarging your technical and practical knowledge.

MAIL TODAY!

SEATTLE . . . With the start of the new year program, a luncheon-tour meeting was held Oct. 20 for Seattle section members, wives, and guests at the Transport Division, QC department, Boeing Airplane Co. After the cafeteria luncheon, C. F. Hill, quality control chief, gave a brief talk on some of the problems encountered in the production of commercial aircraft for foreign markets. Also, a 15 minute technicolor movie entitled "This is Boeing," was presented.

The group was then divided into parties with a tour guide and proceeded through the various assembly, electrical, painting, and interior design areas. Displays and points of interest were discussed as the group was lead through the various assembly and production phases. The tour was planned to provide an insight on the progressive phases in the manufacture and assembly of both the Boeing 707 Transport and KC-135 Stratotanker.

At the completion of the factory area, we were taken by bus to the pre-flight area and boarded a completed Boeing 707 airplane.

After each person had a chance to look the airplane over, a demonstration was given by Mr. Hill on some of the customer conveniences and safety features of the airplane. After the demonstration, it was evident why the leading airlines of the world are using the Boeing jet transports to serve their customers.

It was concluded, at the completion of the tour, that it had been a most interesting and educational meeting.

D. C. Lillis

SOUTHERN CONNECTICUT . . . At a meeting at the Burndy Corp., Norwalk, Conn., Oct. 12, John Kidwell, QC director, Lycoming Division, Avco Corp., Stratford, Conn., spoke on "Quality Control's Position in Reliability." He emphasized that since reliability is a defined, measurable quality characteristic, we in QC are in the reliability business, whether we like it or not. As evidence of this trend in thinking, Mr. Kidwell cited the recent histories of the quality control committee of the Aerospace Industries Association and of the ASQC Reliability Engineering Technical Committee. Also, military customers themselves are demanding that the QC function control the quality characteristic "reliability."

On Jan. 11, the section will visit Aerosol Techniques, Inc., in Bridgeport, Conn., and will be addressed by their QC manager, Phil Kloppe, on "Quality Control in the Aerosol Industry."

Robert E. Kleid

SOUTH TEXAS . . . A basic statistics course is currently being sponsored by this section at the University of Houston. It has proven to be very popular.

Ed Franklin

SYRACUSE . . . A highly successful inspection clinic conducted jointly with the Utica section was held at Drumlins on Oct. 18. Dr. A. V. Feigenbaum, ASQC vice president, was among the distinguished speakers.

During the past month, the Syracuse section became affiliated with the Manufacturers' Association of Syracuse, making possible access to services of the association and increased contact with management of Syracuse area industry.

Klare L. Teegarden, section chairman, has been appointed area advisor for area 4 of the educational committee of the Technical Societies' Council of greater Syracuse. His duties include coordination of the activities of the science advisory committee for seven high schools in the area.

Lee E. Huyler, Jr.

TENNESSEE . . . The second in a series of QC training sessions was held at the October meeting. H. A. Lasater, Union Carbide Nuclear Co., conducted the session. Purpose of these sessions is to familiarize area industries in the use of QC. Following the training session, Don Rickard, Spin Laboratory, Knoxville, Tenn., spoke on "Instrumentation Used in Textile QC." Mr. Rickard also demonstrated some of the gages developed by Spin Lab for measuring the fiber characteristics of cotton.

During future meetings, gages used by area manufacturers will be displayed to familiarize members with the various gage types.

An executive committee meeting, composed of Northeast Tennessee and Tennessee section members, was held for the planning of the annual clinic which is sponsored by the two sections. At present, plans are to include in this year's clinic training sessions at the basic and advanced levels in addition to the individual papers.

J. P. Reavis

TORONTO . . . On Oct. 5, N. McCarthy, quality assurance manager, Canadian Westinghouse Co., Ltd., Hamilton, Ontario, spoke on the application of QC in the Electrical Industry.

On Oct. 19, in spite of the rain, a large group of members and friends turned out to enjoy a visit through John Inglis Co., Scarborough, Ontario. Mr. MacIntosh and staff explained the various phases of marine and steam turbine construction.

Keep March 11 open for our annual All Day QC Forum!

G. E. Culver

TRENTON . . . Section officers for the season are John Marck, chairman; John Wargo, vice chairman; Robert Brewer, secretary, and Harry Kleinkauf, treasurer.

On Oct. 27, Ralph Reeves, manager of quality coordination and facilities in the fabrication plant of RCA Camden, described "The Effects of Tape Controlled Machines on Quality Control." His talk was accompanied by a color film on tape controlled drill presses.

Mr. Reeves is an ASQC director, a graduate of the University of Oklahoma, and is active in the Philadelphia ASQC section

After a break for refreshments, "The Mackinac Story," a movie about the construction of the world's largest suspension bridge, was shown.

Julius S. Mazakis

UTICA . . . On Jan. 19, Richard R. Landers will speak on "Product Assurance to Meet Management's Quality Objectives," at Hotel Utica. Mr. Landers is chief, TAPCO reliability office, Thomson Ramo Wooldridge Inc., Cleveland, Ohio. His presentation attempts to critically and honestly examine the collective field of assurance techniques to determine the basic needs of management in discharging the responsibility to the customer.

On Oct. 18, the Utica and Syracuse sections sponsored a QC conference at Drumlins Country Club, Syracuse, N.Y. The day long affair covered manufacturing organizations and component and equipment reliability and sampling plans. Featured speaker was Dr. A. V. Feigenbaum, manager of manufacturing operations and QC services, General Electric Co.

D. Yeaton

WACO . . . A very interesting and informative talk was presented by C. F. Lewis, metallurgical engineer, Cook Heat Treating Co., Houston, Texas. Mr. Lewis discussed various non-parametric tests and their use. This was especially significant, as it followed a similar presentation on parametric tests given during the previous month.

Donald H. Barrett

WESTERN MASSACHUSETTS . . . Warren R. Purcell, a vice president of ASQC, will be the guest speaker for the Jan. 10 meeting to be held in the Garden Lounge, Hotel Shelton, Springfield, Mass. An old friend of the section, he is currently director of QC, Raytheon Co., Waltham, Mass. He will speak on "Quality Cost Control." The Technifax Corp., Holyoke, Mass., will act as his sponsor in keeping with the feature adopted this season of a neighboring industry sponsoring each meeting. The resident manager of Technifax will introduce Mr. Purcell. The meeting begins at 8 p.m., preceded by a dinner at 6:30 p.m.

Our first meeting of the season following our annual outing proved extremely interesting and was very well attended. Feature of the evening was a talk on "Practical Management of QC," by Ralph Wareham, first ASQC executive secretary and the second ASQC president.

Alan J. Donnelly

WICHITA . . . The 15th Midwest Conference in Wichita, Kans., Oct. 14-15, was an apparent success. The following statistics are an indication of the widespread interest: attendance — 544 plus students and other technical society members who were invited to view the exhibits; states represented — 25 plus Washington, D.C.; companies — 120; colleges and universities — 7; Government agencies — 10; products and services — 60. Participants have given their enthusiastic approval of the Conference.

The Nov. 1 section meeting with Curtis Williams was very interesting. An attendance of 70 heard Mr. Williams present "Outgoing Quality and Customer Complaints."

Harry O. Hehner, QC manager, Monsanto Chemical Co., St. Louis, Mo., will be our speaker for Jan. 17. Mr. Hehner was very well received as one of our Conference speakers. We anticipate an excellent January meeting.

Howard K. Mitchell

WINDSOR . . . Bonjour, Monsieur — another successful "Management Night" was established Oct. 19 in Windsor. This joint "Dinner Meeting" with representation by the Greater Detroit section, was hit with very topical subjects. Guests included J. A. Anderson, vice president and general manager, and Lloyd Steward, director of reliability, A. C. Sparkplug Division, GMC, Flint, Mich.

A group of 170 QC men heard Mr. Anderson say that management is directly responsible for quality control in industry today and QC must work from the top down. Mr. Steward related the part of reliability in QC with the use of color slides to indicate that a number of given articles must function in an assembly. Through a program of reliability, we strive to ensure that parts are meeting established specifications.

A. J. Hewitt

WORCESTER . . . The section was host to the 14th New England Conference at the Hotel Bancroft Oct. 19-21. New attendance records were attained.

Charles W. Carter, Industrial Management Consultant, will speak at a dinner meeting Jan. 19. His subject, "Mal-Distribution, Key to the QC Effort."

Daniel J. Burda

YOUNGSTOWN . . . On Oct. 6, Willard Cheek, senior research physicist, General Motors Technical Center, Warren, Mich., spoke on "Vision, Fusion, and Confusion." He urged the American people not to fear atomic energy but rather to develop its great potential for peacetime uses.

On Jan. 5, Stephen T. White, QC Engineering Service, Manufacturing Services, General Electric Co., New York, N.Y., will speak on "The QC Engineering Job."

On Feb. 2, Jay O. Mack, U.S. Steel Corp., Fairless Works, Fairless Hills, Pa., will cover "Steel Mill QC."

Charles T. Wirebaugh

Significant Differences

. . . Allentown-Bethlehem — Our local publicity is being handled this year by **Bob Horstman,** Rodale Manufacturing Co., and it's good to note that we're getting much better coverage in the local press and on radio than we have had in past years. Nice going, Bob!

LeRoy Duncan, Reading Tube Co., chairman of the Reading sub-section, is using some of his spare time teaching night courses at Albright College, Reading, Pa.

We're a little late on this, but we'd like to report a real "meeting of QC minds" that was brought to our attention. **Bill Ziegler,** QC engineer, and Miss **Jean Snyder,** process checker, both of the Laureldale Western Electric installation, were united in marriage during the past summer. Can you fancy the household that *two* QC people will maintain?

. . . Baltimore — For his work in compiling the DOD-H109 *Quality Control and Reliability Handbook,* **H. Ellner** received a special commendation from the Office of the Assistant Secretary of Defense.

. . . Battle Creek-Kalamazoo — **Howard E. Santee,** chief inspector, Allen Electric and Equipment Co., has transferred to be supervisor of meter assembly production.

. . . Boston — Significant differences include **Bob Stoffel,** QC engineer, B. F. Goodrich, Footwear & Flooring Division, to Foster-Grant Co., Leominster, Mass.

Charles Hesselin is now QC engineering chief, Industrial Components Division, Raytheon. **Herbert Hoyle** is now director of manufacturing services, Industrial Components Division, Raytheon.

Bob Medler is now with Computer Controls, Farmingham, Massachusetts.

Dave Palamountain is now teaching QC courses at Boston University. **Joe Hansen** is now teaching mathematics at University College, Northeastern University.

Charles Ghiglio has moved from the Hartford section to Alden Products, Brockton, Mass.

. . . Buffalo — **Charles A. Bicking,** Carborundum Co., Niagara Falls, N.Y., recently spoke at the Eleventh National Conference on Standards at the Sheraton-Atlantic Hotel, New York, N.Y. Limited copies of Mr. Bickings speech are available from ASA, 10 E. 40 St., New York 16, N.Y., at 50 cents each.

. . . Columbia — **Robert S. Ickes,** QC department chief, Western Electric Co., has been promoted to assistant superintendent, Operating Division, Allentown, Pa.

. . . Corning-Elmira — **David O. Berke,** QC manager, Technical Products Division, Corning Glass Works, conducted a Workshop Seminar on QC at the American

Management Association Meeting Oct. 26-28 at the Hotel Astor, New York, N.Y.

. . . Dallas-Fort Worth — The membership committee has plans in action for increasing membership and attendance. The plan establishes 24 telephone committees and is based on the team concept. The plan has been favorably received by the membership, and is expected to sharply increase attendance at our regular meetings.

. . . Dayton — At the Dayton AF Depot, **Robert B. Smock** has been appointed chief of the mechanical standards branch and **Edward H. Fratus,** has been appointed chief of the electro-mechanical standards branch.

. . . Denver — **Bill Christian,** section secretary, has been forced to resign due to a promotion as sales manager of Hathaway Instruments. **Jerry Dyer** is the new QC manager at Hathaway. Congratulations to both!

. . . Georgia — **Ivan L. Lester,** technical director, Mead Packaging Division, Mead Corp., Atlanta, Ga., presented a technical paper at the 15th Plastics and Paper Conference of the Technical Association of the Pulp and Paper Industry at the Hotel Syracuse, Syracuse, N.Y., Oct. 16-19. The title — "Paper and Plastic Requirements for the Expresso Carton and Machine Operation."

. . . Greater Detroit — **Jack Diggs,** formerly with the QC department of Detroit Transmission Division, is now industrial engineer at Vinco Corp.

The appointment of **Howard E. Lang** as manager of QC engineering for Fruehauf Trailer Company has been announced by **Robert Vujovich,** QC director, Detroit, Mich. Mr. Lang was formerly department head of quality audit, Missile Division, Chrysler Corp.

. . . Hamilton-Middletown — On Jan. 28, the section will combine efforts with the Cincinnati section for the joint Tenth Annual All Day Conference. This year the conference's panels will range from introduction to QC to practical advancement of quality for the chemical, mechanical and bulk industries. Conference co-chairmen are **Vernon Eckland,** Procter & Gamble Co., and **James Sorenson,** Aeronca Manufacturing Co., Middletown, O.

. . . Hartford — **Marty Keston** has taken a position of general foreman with Dynamic Controls, East Hartford, Connecticut.

. . . Kankakee-Joliet — **Warren Chamberlain,** former section chairman, has been promoted administrator of commodity price analysis, General Foods Corp., White Plains, N.Y. He is being succeeded as QC manager at General Food's plant in Kankakee, Ill., by **Charles Grosche,** present section secretary.

. . . Kansas City — **Cliff Cutler,** section chairman, has been promoted to department head, QC department, Hallmark Cards.

. . . Los Angeles — Monthly attendance this year has been more than 300 members and guests. Last year's average was 100. Section meetings are now attracting chief engineers, reliability managers, and purchasing managers from the major aircraft and missile producers.

William H. Rickards has been appointed operations manager of the Matrix Connector Division, Matrix

5th ASQC Workshop-Seminar

MANAGEMENT OF QUALITY CONTROL

January 16 - 17 - 18, 1961

Penn Sheraton Hotel, Pittsburg, Pa.

What is the purpose of the workshop seminar? To explore in depth, tested methods of increasing the effectiveness of the quality control program in an industrial plant.

For whom is the program planned? For present and prospective Quality Managers. It is expected that the applicant will have reasonable familiarity with such standard texts as Grant, Feigenbaum, and Juran. To benefit properly from the seminar, the applicant should have a minimum of several years experience with major responsibility for quality.

Registrants will be sent study materials and case studies prior to the conference. Registration is limited to 75 persons and is complete only on receipt of the registration fee of $125 for non-members, $100 for members, which includes the cost of three lunches.

Your Registration will be acknowledged. A room reservation card for the Penn Sheraton Hotel will be enclosed with the acknowledgment.

ASQC Institute
Paul C. Clifford, Director

Fifth ASQC Workshop - Seminar
ASQC Institute
161 West Wisconsin Avenue
Milwaukee 3, Wisconsin

Please make reservations for the fifth ASQC Workshop-Seminar on Management of Quality Control for the following man:

Enclosed is our check for $..... to cover..... registrants. Fee—$125 for non-members, $100 for members.

Name .....

Title .....

Company .....

Address .....

City.....**Zone No.** ....**State**.....

NOTE: Additional registrations may be made by attaching a list to this coupon. Please include necessary information for each registrant.

Science Corp., Burbank, Calif., in charge of all production, materiel, and planning departments and functions. He was formerly plant manager and chief engineer of the Ward Products Division, Gabriel Co., Cleveland, Ohio, and executive engineer in charge of research, engineering and quality control with the Radiart Division, Cornell-Dubilier Corp., Cleveland, Ohio, for nine years.

. . . Metropolitan — **Harry D. Greiner,** formerly of the Budd Co., is now with the Defense Electronics Products Division, RCA, Moorestown, N.J., as a quality manager.

Robert L. Schwerin has been appointed QC manager of the Paramus, N.J., plant of ACF Industries electronics division.

. . . Milwaukee — **George R. Eichelberger** has joined the Jos. Schlitz Brewing Co., as a business research statistician and analyst. He was formerly chief statistician in the product planning department, Patrick Cudahy, Inc., Cudahy, Wis.

. . . Minnesota — **George Craycraft** of Milwaukee has moved to the Twin Cities as QC manager at the Lake Street Plant for Minneapolis Moline. Welcome to the Minnesota section, George!

Lowell Nystrom, winner of our section scholarship last year, is back at the University of Minnesota teaching two QC courses and continuing his studies for a Ph.D. in Industrial Engineering. During the summer, Mr. Nystrom worked at Remington Rand Univac and conducted courses well worth attending.

. . . Montreal — The Montreal chairman, **F. Clow,** is "enjoying" an extended "vacation" in the Montreal General Hospital. The vice chairman, **W. L. Wingfield,** TCA, is ably carrying on.

. . . Northeast Tennessee — **Ralph DeBusk, Bob Chambers,** and **Stan Murray** attended the Chemical Division Conference in Chicago, Nov. 3-4.

Mechanical, Electrical, Industrial Engineers and Statisticians Preferably at Advanced Degree Levels

For Manufacturing Development Quality Control to develop statistical quality control systems and techniques. Working with Design and Manufacturing organizations establish product quality requirements, process controls and coordinate data and manufacturing procedure needs.

Analyze inspection and test results, determine causes for variation and establish bases for corrective action. Conduct pre and post contractual surveys at suppliers' plant.

Sandia Corporation, located in Albuquerque, N. M., is engaged in research and development of nuclear weapons and other projects for the AEC. Albuquerque is a modern city of over 200,000; has an excellent climate and many cultural and recreational attractions. Winters are mild, summer nights are cool, and there's plenty of year-round sunshine. Liberal employee benefits include generous vacations, retirement and insurance plans, and an educational assistance program. Paid relocation allowance.

Send resume to: Professional Employment Section 564.

SANDIA CORPORATION

ALBUQUERQUE, NEW MEXICO

Carl Wilson has been appointed "Program Chairman for General Papers," at the QC Clinic at the University of Tennessee in March. **Mike Gomez** has been appointed to the publicity committee for the clinic.

C. E. Stone, section treasurer, and **M. Gomez,** section reporter, attended the Bristol Employee Relations Conference in Bristol, Tenn., on Oct. 20.

. . . Pensacola-Mobile — **F. J. Seguin,** section secretary, has been appointed acting chief of the quality analysis branch, Directorate Supply and Transportation, Hq. MOAMA.

John W. Comish, section chairman, has been appointed to chief, Quality Management Division, Staff Quality Control Office, Hq. MOAMA.

. . . Philadelphia — **Harry Greiner** recently changed positions and is presently QC manager, RCA, Moorestown, New Jersey.

Arthur D. Coleman has joined International Resistance Co., Philadelphia, Pa., as a senior quality assurance engineer in the firm's high reliability resistor project. Mr. Coleman was formerly associated with the Systems Division, Clifton Precision Products Co., Inc., Clifton Heights, Pa., where he was manager of reliability and quality assurance.

. . . Pittsfield — **Dave Antos** has been promoted from staff QC engineer to assistant supervisor of the Lee Mill, P. J. Schweitzer, Division of Kimberly Clark Corp.

Jack Wend of P. J. Schweitzer, Division of Kimberly Clark Corp., has been promoted from supervisor in the technical department laboratory to staff QC engineer.

Leonard Kroll has been promoted from staff QC engineer of the P. J. Schweitzer Division of the Kimberly Clark Corp., to technical superintendent of the Division's Mt. Holly Springs Mill.

. . . Portland — **Dr. Oliver Worthington,** Oregon State College, has been transferred to Indonesia. His address: Fakultan Perpanian and Kedokteran Hewan, Kentucky Contract Team, Post Box 54, Bogor, Java, Indonesia.

Bill Conrad, Lucky Lager Brewing Co., has been welcomed back after his recent illness.

. . . St. Charles — The section once again has had a good turnout for their basic statistics course. It was taught by **Earl Egli,** Zenith Radio Corp.

Membership this year in our section is continuing to grow, having already passed last year's figure.

. . . San Bernardino—**Larry Beldauf** has been promoted to corporate manager of supplier quality, and **Philip Reiter** to manager, corporate QC policies and procedures, Aero Jet General Corp.

Bob Glasscock is now QC manager, Azusa plant, Aerojet General Corp.

. . . Syracuse — **O. William Irving** has transferred from the Electric Autolite Co., Syracuse, N.Y., to the Fancher Furniture Co., Salamonca, N.Y., where he is director of quality assurance.

. . . Toronto — **Thomas H. Grigg,** formerly with Smith and Stone Co., Georgetown, Ont., has been appointed QC director, American Motors Ltd., Brampton, Ont.

. . . Western Massachusetts — **Stanley E. Lezinski,** 1959-60 Saddoris Award chairman has completed his work as instructor for the first six weeks of the QC course offered by the section at the Holyoke, Mass., high school. **Hyman Edelstein,** current section education committee chairman, will instruct the remaining six weeks of the course. Both instructors participated in the educational sessions at the 14th New England QC conference at Worcester, Mass., Oct. 19-21.

. . . Worcester — Two section members are conducting QC courses at Worcester Junior College. **Art Pingalore** is teaching the fundamental course and **Axel Sternlof** is teaching the advanced course. Art is publicity chairman and Alex is junior past chairman.

Said J. Stefan and L. Boltzmann: *"The total radiation from a black body is proportional to the fourth power of the absolute temperature of the black body."*

Radiation is usually associated with high temperatures. Yet very cold bodies emit a radiation which can be highly significant in missile and space applications. The problem faced by infrared scientists, trying to detect variations in radiation from low temperature atmospheres, can be likened to detecting a one-foot cube of ice from a distance of five miles.

Lockheed Missiles and Space Division scientists are deeply engaged in studying the problems of infrared emission from the earth and its atmosphere, as seen from orbital altitudes. Although the earth resembles a black body at 300° Kelvin, the emission from its atmosphere, under some circumstances, is much colder. To make measurements under these circumstances, Lockheed has evolved radiometric equipment with one of the most sensitive detection systems yet conceived.

Scientists and engineers must also take careful measurements of a potential employer. Lockheed Missiles and Space Division in Sunnyvale and Palo Alto, California, on the beautiful San Francisco Peninsula, invites this close scrutiny. As Systems Manager for the DISCOVERER, MIDAS and SAMOS satellites and the POLARIS FBM, Lockheed preeminence in Missiles and Space creates positions in many disciplines for outstanding engineers and scientists.

Why not investigate future possibilities at Lockheed? Write Research and Development Staff, Dept. M-13B, 962 West El Camino Real, Sunnyvale, Calif. U.S. citizenship or existing Department of Defense industrial security clearance required.

Lockheed / **MISSILES AND SPACE DIVISION**

Systems Manager for the Navy POLARIS FBM; the Air Force AGENA Satellite in the DISCOVERER, MIDAS and SAMOS Programs

SUNNYVALE, PALO ALTO, VAN NUYS, SANTA CRUZ, SANTA MARIA, CALIFORNIA · CAPE CANAVERAL, FLORIDA · HAWAII

SECTION CALENDAR (JANUARY 1 TO FEBRUARY 10)

SECTION	DATE	PLACE	TIME	SUBJECT	SPEAKER
Akron-Canton	Jan. 12	Iacomini's	8:00 p.m.	Evolutionary Operation	Dr. John C. Whitwell, Princeton University
Albany	Jan. 12	The Crossroads, Latham	4:30	Probability Distribution	Irving W. Burr, Purdue University
	Feb. 12	The Crossroads, Latham	4:30	High Quality Through Quality in People	E. V. Grumman, Bullard Co., Fairfield, Conn.
Allentown-Bethlehem	Jan. 18	Hotel Traylor	7:00	Short Run QC	Miss Bonnie Small, Western Electric Co.
			8:00	The Challenge of Reliability	W. A. MacCrehan, Bendix Radio
	Feb. 8	Hotel Traylor	7:00	Short Run QC	Miss Bonnie Small, Western Electric Co.
			8:00	Vendor-Consumer Relations	A. P. Stergion
Baltimore	Jan. 17	Baltimore Memorial Stadium	8:15	To Test or Not to Test — and Why	R. W. Williams, Westinghouse Electric Corp., Baltimore, Md.
Battle Creek-Kalamazoo	Jan. 19	Upjohn Co., Kalamazoo, Mich.	8:00	The Search for Reliability	Nelson G. Meagley, Continental Aviation and Engineering
Birmingham	Jan. 13	Hotel Stafford Tuscaloosa, Ala.	6:30	QC-Probability Applications	Paul Hassell, University of Alabama
Boston	Jan. 12	MIT Faculty Club	5:00	Control of Incoming Material	Ken Gleason, Gillette Safety Razor Co.
			8:00	What Does Production Manager Expect from QC	Bruce W. Atchinson, Jr., Stanley Tools, New Britain, Conn.
Buffalo	Jan. 30	Westbrook Hotel	6:30	Machine & Process Capabilities	Wilbur Myers, Delco Appliance Division, GMC, Rochester, N.Y.
Charleston	Jan. 19	Kanawha Hotel	8:00	Reliability of Laboratory Data	Local Panel
Chattanooga	Jan. 9	United Hosiery Mills	....	Plant tour	Keith Wilson
Cincinnati	Jan. 26	Cincinnati, Ohio	9:00 a.m.	Tenth Annual QC Conference	Various
Cleveland	Jan. 6	Cleveland Engineering & Scientific Center	7:45 p.m.	Decision Making Practices in QC	Participation meeting
Columbus	Jan. 4	Broad Street Christian Church	6:30	Metallurgical QC	D. H. W. Allan, American Iron and Steel Institute, New York, N.Y.
		Battelle Memorial Institute	8:00	Reliability Field Failure Reporting	Robert Yeareance, Sr.
Corning-Elmira	Jan. 10	Elmira, N.Y., Hardinge Bros.	6:30	Annual Plant tour	.....
Dallas-Fort Worth	Jan. 19	Circle C Steak House, Grand Prairie, Texas	7:00	Nuclear Energy Goes to Work	Joseph L. Bernik, Nuclear Division, Martin Co., Baltimore, Md.
Dayton	Jan. 12	Frigidaire Division, GMC, Plant I	8:00	Simplified Approach to Analysis of Variance	Dr. J. N. Berretoni, Western Reserve University, Cleveland, Ohio
	Feb. 9	Suttmiller's Restaurant	6:30	Discussion of Better Business Bureau Activities	Hazel Nolan, Dayton Better Business Bureau
Chicago	Feb. 8	Bar Association Charter Hall 11th Floor, 29 S. LaSalle, Chicago, Ill.	6:30	Data Processing Machines	Dr. Hodge, IBM
Erie	Jan. 19	Pennsylvania Electric Co.	7:00	Introduction of Acceptance Sampling	.....
Evansville-Owensboro	Jan. 10	Evansville, Ind.	6:30	Machine Capability Process Studies	C. R. Wade, Whirlpool Corp., Evansville, Ind.
Greater Detroit	Jan. 19	Dodge Assembly Plant	....	What Happened to Inspection?	C. G. Bauer, Chrysler Corp.
Greater Muskegon	Jan. 12	Grand Rapids	6:30	Joint meeting with Grand Rapids section	Plant tour of Lear, Inc. Grand Rapids, Mich.
	Feb. 9	Black Angus	6:30	To be announced	Charles Anderson, Davenport Institute, Grand Rapids, Mich.
Hamilton-Middletown	Jan. 4	Sports Bowl, Middletown, Ohio	6:30	Effective Measurement of Quality Costs	James R. Harrison, Wright-Patterson AFB, Ohio
Hamilton, Ontario	Jan. 12	Roberts Restaurant	6:30	Management Responsibilities to Produce a Reliable Product	W. A. MacCrehan, Bendix Corp., Baltimore, Md.
Harrisburg	Jan. 4	Arcadia Cafe, Lancaster, Pa.	6:30	Operation Research (Joint meeting with ACS)	F. Gropper, E. I. DuPont Co., Wilmington, Dela.
	Feb. 1	VFW	6:30	Selling QC to Management	Panelists from membership
Hartford	Jan. 10	Nutmegger House	6:30	Design of Industrial Experiments	Allen R. Crawford, Standard Oil Co.
	Jan. 26	Hotel Bond, Hartford, Conn.	9:00 a.m.	One Day Seminar	Dorian Shainin, Rath & Strong, Industrial Consultants
Huntsville	Jan. 18	Huntsville	6:30 p.m.	To be announced	J. Y. McClure, ASQC President
State University of Iowa	Jan. 29	LeClair Hotel, Moline, Ill.	8:00	Simplify QC Techniques — Make Your Own Nomograph	Prof. L. G. Mitten, Northwestern University
Kankakee-Joliet	Jan. 10	Chicago Heights	6:30	EVOP and Office Machines	Mrs. Florence Pohley Ritz
	Feb. 7	Joliet	6:30	Sampling	Robert Banzhaf
Kansas City	Jan. 19	Lantern Restaurant	7:00	Gaging and Automation	R. E. Ruppert, Sheffield Corp.
Lima	Jan. 10	Superior Tube, Wapakoneta, Ohio	7:30	Sampling Inspection, a dramatization	D. C. Fultz, Ford Motor Co., Lima, Ohio
Los Angeles	Jan. 24	IAS Bldg.	7:00	Hughes Aircraft Panel	P. J. Mallon, Dr. N. I. Hall, J. J. Tamsen
	Jan. 5	IAS Bldg.	7:30	Use of Optical Inspection Tools (Inspection Division)	A. Sheddon
			7:00	To be announced (Electronic Division)	F. Squires, QC Consultant
Louisville	Jan. 9	To be announced	8:00	Experimental Design	Bruce Drew, Pillsbury, Inc.
Memphis	Jan. 17	Memphis Athletic Club	6:30	QC — A Production Necessity	J. Y. McClure
Metropolitan	Jan. 17	Hotel Shelburne	7:30	Measuring Effectiveness of the QC Function (Dinner Meeting)	Warren Purcell, Raytheon Corp.
	Feb. 4	Seton Hall University, South Orange, N.J.	9:30 a.m.	Applications of Statistics in the Chemical Industry	Dr. Ellis R. Ott (luncheon speaker)

Mid-Hudson	Jan. 3	Hotel DiPrima, Highland, N.Y.	8:00 p.m.	Comparative Quality Measurement of Dissimilar Product	John F. Crowley, IBM Corp., Poughkeepsie, N.Y.
	Feb. 7	Hotel DiPrima, Highland, N.Y.	8:00	Who Has Responsibility for Quality Improvement?	H. L. Mirick, IBM Corp., Kingston, N.Y.
Milwaukee	Jan. 16	Milwaukee Inn	7:30	An Introduction to Cumulative Sums	H. Mack Truax, Atlas Powder Co.
Minnesota	Jan. 10	Holiday Lodge	6:30	Acceptance Sampling and New Life Test (Joint meeting with ASA)	Prof. Milton Sobel, University of Minnesota
	Feb. 1	Holiday Lodge	6:30	Ladies' Night: Talking Your Way Into Trouble	Prof. G. Shapira, Speech Department, University of Minnesota
Montreal	Feb. 14	Hotel Lowry, St. Paul, Minn.	9:00 a.m.	One Day Clinic	Various
	Jan. 11	CIL Bldg.	8:15 p.m.	QC System in a Factory	R. L. Myers, Westinghouse Electric Corp. Elmira, N.Y.
	Feb. 8	Dominion Rubber Co.	8:15	Commonsense Organization for Applied QC	D. W. Guthrie, Dominion Rubber, Montreal
Muncie	Jan. 19	Ball State Student Center	6:30	Processing Statistical Data Through IBM	Kingsley Forry, Owens-Illinois Co., Toledo, Ohio
Northeast Tennessee	Jan. 12	Kingsport, Tenn.	6:00	How to Unearth And Implement Cost Reduction Ideas	Dorian Shainin, Rath & Strong Industrial Consultants, Boston, Mass.
Oklahoma City	Jan. 17	Peery's	6:00	How You Can Make a Multi-Plant QC Program Work	Harry O. Hehner, Monsanto Chemical Corp. St. Louis, Mo.
Omaha-Lincoln	Jan. 13	Town & Country Steak House, Lincoln, Nebr.	6:30	Reports of Past Presidents	.....
Parkersburg	Jan. 18	Chancellor Hotel	7:30	QC for Underseas Cable Manufacture	Jack Meredith, C & P Telephone Co., Parkersburg, W. Va.
Pensacola-Mobile	Jan. 24	Holiday Inn, Mobile, Ala.	6:30	QC — A Production Necessity	J. Y. McClure
Philadelphia	Jan. 19	Germantown Cricket Club	6:15	Everyday Applications of QC Techniques (Joint Meeting with ASTM)	Dr. Joseph Juran, Management Consultant
Pittsburgh	Jan. 24	YWCA, Wood St. & Blvd. of Allies	6:30	Incomplete Block Designs	W. H. Clatworthy, Westinghouse Electric Corp.
Pittsfield	Jan. 18	Stanley Club	8:00	Ensuring Reliability In Paper for Use in the Defense Industry	F. Hartwell of P. J. Schweitzer Div., and R. Powell, Sprague Electric
Portland	Jan. 10	Omark Industries Fastening Plant	7:30	Problem in Automated Inspection	Herman Karlebach, Omark Industries
Rhode Island	Jan. 19	Engineering Society Bldg., Providence, R.I.	8:00	How Wage Incentives Effects the Quality of a Product	H. Russell Beatty
Rochester	Jan. 17	Chamber of Commerce	6:15	QC in the Foods Industry	Robert N. Johnson, Kroger Grocer Co.
St. Charles	Jan. 17	Tally-Ho, North Ave., West Chicago, Ind.	6:30	The Professional Stature & Growth of QC	Frank McLaughlin, General Electric Co.
St. Petersburg-Tampa	Jan. 9	St. Petersburg Jr. College	8:00	Statistical Significance of Outlying Observations, QC and Operations Research	Dr. F. E. Grubbs, Aberdeen Proving Grounds, Md.
San Antonio	Jan. 17	Tommies Restaurant	7:00	Nuclear Energy Goes to Work	J. L. Bernik, Martin Co., Baltimore, Md.
San Bernardino	Jan. 28	Mission Inn, Riverside, Calif.	9:00 a.m.	Inland Empire Conference	Various
San Francisco	Jan. 9	Old Plantation, Los Altos	7:00 p.m.	Plant Tour	Hewlett Package Co.
Santa Maria-Vandenberg	Jan. 10	Santa Maria Club	6:30	QA at Convair	To be announced
Seattle	Jan. 10	Benjamin Franklin Hotel	7:30	Vendor Quality Rating	Loren Austin, Boeing Airplane Co., Seattle, Wash.
Southern Connecticut	Jan. 11	Aerosol Techniques, Inc., Bridgeport, Conn.	.....	QC in the Aerosol Industry	Phil Kloppe, Aerosol Techniques, Inc., Bridgeport, Conn.
	Feb. 8	Colonial Steak House, Ridgefield, Conn.	.....	QC in the Cosmetic Industry	.....
South Texas	Jan. 18	Ben Milam Hotel	7:00	Nuclear Energy Goes to Work	J. L. Bernik
Syracuse	Jan. 24	Drumlins	6:30	Why Not Take Advantage of Your Errors	John E. Biegel, Syracuse University
Tennessee	Jan. 19	Knoxville, Tenn.	7:30	Application of QC in Lock Manufacturing	Robert McBride, Yale Towne Manufacturing Co., Lenoir City, Tenn.
Toronto	Jan. 11	Canadian General Electric	8:00	Bulk Sampling Problem, What to Do?	R. S. Bingham, Jr., Carborundum Co. Niagara Falls, N.Y.
	Jan. 25	Canadian General Electric	8:00	Managing QC Activities (Study Group)	S. Brodsky, Canadian General Electric Ltd., Toronto, Ont.
	Feb. 8	Canadian General Electric	8:00	Vendor-Vendee Problem And SQC	J. H. Molner, Houdaille Industries, Inc. Detroit, Mich.
Utica	Jan. 19	Hotel Utica	6:00	Product Assurance to Meet Management's Quality Objectives	Richard R. Landers, Thompson-Ramo-Wooldridge Inc., Cleveland, Ohio
	Feb. 7	Andersen's Pea Soup, Buellton, Calif.	6:30	The "Pea" Factor in QC	Robert T. (Pea Soup) Andersen
Waco	Feb. 20	Leslie's Chicken Shack	6:30	Non-Destructive Testing	B. E. Justice, Convair, Fort Worth, Texas
Western Massachusetts	Jan. 10	Shelton Hotel, Springfield, Mass.	6:30	Quality Cost Control	Warren R. Purcell, Raytheon Co., Waltham, Mass.
Wichita	Jan. 17	Beech Employees Club Cafeteria	6:30	How You Can Make a Multi-Plant QC Program Work	Harry O. Hehner
Windsor	Jan. 9	Prince Edward Hotel	6:30	QC and Manufacturing Engineering	David N. Smith, Jones & Lamson Machine Co.
Worcester	Jan. 19	Worcester Polytechnic Institute	7:00	Mal-Distribution, Key to the QC Effort	Charles W. Carter, Industrial Management Consultant
Youngstown	Jan. 5	Astoria Cafe	6:30	The QC Engineering Job	Stephen T. White, General Electric Co., New York, N.Y.
	Feb. 2	Astoria Cafe	6:30	Steel Mill QC	Jay O. Mack, U.S. Steel Corp., Fairless Hills, Pa.

ASQC Announces

ADVANCEMENT TO THE GRADE OF SENIOR MEMBER

(as of September 30, 1960)

ANDERSON, BYRON O., Tulsa, Okla.
CHEEVER, NORMAN W., Pittsfield, Mass.
COURTNEY, RICHARD E., Huntsville, Ala.
DI DARIO, MARIO M., Milltown, N. J.
HARTWELL, FREDERICK C., Lee, Mass.
JONES, ROBERT V., Warren, Ohio
KEGG, WENDELL D., Alliance, Ohio
KROLL, LEONARD, Lee, Mass.
LEADBETTER, EDWARD L., Staatsburg, N.Y.
MCKENNA THOMAS A., Jr., Orange, Texas
MELTON, REGINALD W., Overland, Mo.
NEIL, WILLIAM, Webster Groves, Mo.
NIMZ, JAMES A., Richmond, Virginia
REINHOLD, FRED, Stroudsburg, Pa.
SLINGERLAND, DOUGLAS A., Lenox, Mass.
WOOD, LOREN E., Bellevue, Wash.

(as of October 31, 1960)

BINSON, GUY R., Kalamazoo, Mich.
CLAEYS, MARVIN, Chicago, Ill.
LUFF, ANDREW C., Kalamazoo, Mich.
MANRING, RALPH C., Glendale, Mo.
MIZUNO, MINORU, Kawasaki, Kanagawa, Japan
OLSON, WILMER, Fort Worth, Texas
PILON, DENYS A., Verdun, Que., Canada
REYNOLDS, PATRICK C., Chicago, Ill.
ROBINSON, ERIC D., Memphis, Tenn.
SCHNEEWEIS, BASIL, Newburgh, N.Y.
SMELTZER, VERNIE J., Kansas City, Mo.
STEPHENSON, EDWARD E. JR., Richland, Mich.
WAGNER, FRANCIS J., Denton, Texas

ADVANCEMENT TO GRADE OF MEMBER

(as of September 30, 1960)

CONNOR, ROBERT J., Chicago, Ill.
DODGE, EDWIN, St. Catharines Ont., Canada
JESTER, RALPH G., Brookville, Ind.
PAYLEITNER, DUANE A., Downers Grove, Ill.
PRUTKA, EUGENE M., Kitchener Ont., Canada
SEESHOLTZ, ERNEST C., Richmond, Ind.
WILCOX, ROBERT J., Erie, Pa.

(as of October 31, 1960)

FINROW, VERNON H., Sunnyvale, Cal.
KEMPER, RICHARD C., Minneapolis, Minn.
SMITH, ALBERT F. JR., Harrod, Ohio
WILKES, JOSEPH G., Tamaqua, Pa.
ZAPP, KENNETH A., Dallas, Texas

ADMISSIONS TO THE GRADE OF MEMBER

(As of September 30, 1960)

ADAMS, GEORGE G. H., Portland, Ore.
ADCOCK, WILLIS A., Dallas, Texas
ALBER, MALCOLM L., Branford, Conn.
ALLISON, CHARLES C., Rancho Cordova, Cal.
ALLSTEADT, JOSEPH G., Detroit, Mich.
ANDERSON, ANDREW A., Mansfield, Ohio
ANDERSON, CARL F., Marion, Iowa
ANDREWS, WESLEY R., Liverpool, N.Y.
ARKEBAUER, CHARLES W., San Jose, Cal.
ATHERTON, RALPH, Fitchburg, Mass.
AUBE, GEORGES R., Shelton, Conn.
BAIRD, WILLIAM H., Ontario, Cal.
BAKER, ABNER L., Glendale, Cal.
BAKER, HAROLD J., Greentown, Ohio
BAKER, LATHAN E., South Bend, Ind.
BALABAN, EMIL P., Loves Park, Ill.
BAMFORD, ARTHUR G., Saugus, Mass.
BARNES, JOSEPH S., Fairport, N.Y.
BARON, ABRAHAM, Anaheim, Cal.
BARR, JAMES F., Waterville, Maine
BARROWS, GEORGE H., Cadmus, Mich.
BARTELS, HARRY C., Flourton, Pa.
BECKER, WILLIAM J., Rockford, Ill.
BEEVERS, WILLIAM A., Needham, Mass.
BENDER, BENJAMIN, Queens Village, N. Y.
BICKNELL, ROBYN D., Midland, Mich.
BIEGERT, CHARLES W., Burbank, Cal.
BIENSTOCK, ABRAHAM, Elkins Park, Pa.
BILENKER, EUGENE N., Elizabeth, N. J.
BOLLENBACH, FREDERIC W., Westfield, N. J.
BOLTON, WILLIAM C., Rochester, N. Y.
BONNER, STANLEY V., Chattanooga, Tenn.
BOUGHNER, ROBERT E., Barrington, Ill.
BOURGOIN, LIONEL, Montreal, Que., Canada
BRENDEL, EDWARD N., Burbank, Cal.
BREWER, HARRISON M. JR., South Bend, Ind.
BRINK, PIERRE M., Minneapolis, Minn.
BROOK, HOWARD L., Cedar Rapids, Iowa
BROOKS, MARVIN C., Grosse Pt. Park, Mich.
BROULLIRE, PETER J., Albuquerque, N. M.
BROWN, CONRAD L., Muskogee, Okla.
BRUHWILER, E. MIKE, Downey, Cal.
BRUNDLE, ROBERT G., Thiensville, Wis.
BRUNETTE, RONALD R., Rochester, N. Y.
BUECHEL, WILLIAM J., Webster, N. Y.
BURROWS, PERCY W., Norwalk, Conn.
BUSH, BENJAMIN P., Minneapolis, Minn.
BUSCH, JOHN F., Logan, Ohio
BUSS, CHARLES D., Stockton, Cal.
BYRD, CHARLES S., Marblehead, Mass.
CABALAN, PAUL F., Cedar Rapids, Mich.
CAMPANELLA, JACK, Levittown, N. Y.
CANTORE, PHILLIP, West Haven, Conn.
CARIELLO, JOSEPH A., Framingham Center, Mass.
CARRILLO, FAUSTINO H., Mexico D.F., Mexico
CARTWRIGHT, BRUCE B., Memphis, Tenn.
CERINO, LOUIS A., Stratford Dt., Conn.
CHAINANI, GUL R., Bombay, India
CHAPIN, ALFRED G., Indianapolis, Ind.
CHICHESTER, WENDELL D., Marshall, Mich.
CHILIKOS, NICK G., No. Hollywood, Cal.
COCHRAN, GENE A., Elkville, Ill.
COKER, JESSE J. JR., Pensacola, Fla.
CONGDON, RICHARD L., Dallas, Texas
CONNOR, DONALD C., Lancaster, Pa.
COONEY, JAMES A., Warwick, R. I.
COOPER, GERALD A., No. Bergen, N. J.
COSTA, EDWARD W., Bristol, R. I.
CRANE, CHARLES L., Pittsfield, Mass.
CROSS, KEITH E., Seattle, Wash.
CROWELL, ROBERT P., Lancaster, Pa.
CZERWINSKI, JOSEPH, Alhambra, Cal.
DANNER, FRED W., Columbus, Ohio
DAVIS, THOMAS C., JR., Tulsa, Okla.
DAYCOCK, CHARLES E., Churchville, N. Y.
DE RUNTZ, LEO G., Colmar, Pa.
DE WITTE, HARVEY, Rochester, N. Y.
DENISSOFF, BASILE A., North Aurora, Ill.
DENSEY, HELENE T., Montreal, Que., Canada
DOYAL, JOHN P., Chattanooga, Tenn.
DRAGONE, JOHN J., No. Muskegon, Mich.
DUNCAN, JAMES B., Glasgow, Scotland
DURAND, JAMES D., Coon Rapids, Minn.
DYER, GERALD E., Aurora, Colo.
DYER, JAMES R., Worthington, Ind.
EDLUND, MAURICE W., East Stanwood, Wash.
EDWARDS, HERBERT C., Garland, Texas
EHRHARD, EDWARD R., Chatham, N. J.
FARNHAM, HAROLD E., Marion, Iowa
FAULMANN, ARTHUR G., Palo Alto, Cal.
FEAGIN, JEFFERSON B., Falls Church, Va.
FISCHER, FRANK C., Glenside, Pa.
FLOHR, AUGUST F. JR., Lancaster, Pa.
FLOR, JOSEPH T., Rochester, N. Y.
FLORY, ROBERT A., Muskogee, Okla.
FOLEY, HERBERT W., Penfield, N. Y.
FRANKLIN, EDWIN M., Louisville, Ky.
FRISOLI, DONATO T., Waltham, Mass.
GARNER, JOHN H., Tulsa, Okla.
GEARHART, JERROLD J., Rochester, N. Y.
GIGLIO, JOSEPH, Hamden, Conn.
GLICK, CHARLES E., Corning, N. Y.
GOLDSTEIN, WILLIAM, Waterbury, Conn.
GOTTARDI, ORLANDO F., Los Angeles, Cal.
GRASTY, ROBERT A., Cincinnati, Ohio
GRAY, LEE B., Seal Beach, Cal.
GREEN, TERRENCE L., St. Charles, Ill.
GUESLER, HENRY K., Toledo, Ohio
GUTHRIE, GARRY G., Monrovia, Cal.

Again Available

Transactions of the 1959 Chemical Division

3rd Annual Technical Conference

1959 Transactions include:

Use of Statistical Quality Control Charts in Continuous Chemical Processes, E. S. Aldredge
Some Transformations and Techniques Useful for Graphical Solutions, C. F. Lewis
Determining Sources of Yield Variation in a Multi-step Chemical Process, W. C. Quinn and H. Davidson
Experimental Design — Subdivision of Treatment, M. A. King and F. T. Takenaka
A Field Application of Convariance Analysis, L. D. Pahnke
Effective QC Program for a Knock Rating Laboratory, A. R. Crawford, E. S. McBride and F. W. Kroll
The Grasshopper Program, G. E. Kimball
Estimating the Precision of Test Averages from a Study of Variance Components, E. F. Parmenter
Industrial Application of Non-Parametric Statistics, E. C. Harrington, Jr.
Optical Design Considerations in Response Surface Estimation, J. L. Folks
Variance Components Analysis, A. W. Wortham, J. L. Folks, L. H. Smith
Experimenters, Statisticians and Models, V. B. Shelburne
The Analysis of Means, E. R. Ott
The Analysis of Residuals, L. S. Nelson
Non-Linear Regression, A. W. Dickinson

ASQC, 161 W. Wisconsin Ave. 1-61
Milwaukee 3, Wis.

Please send me .... copies of the 1959 Chemical Division Third Annual Technical Conference Transactions at $2.50 each.

Name .....

Address .....

.....

HAFNER, EDWIN A., Woodbridge, Conn.
HALABY, RONALD J., Sommerville, Mass.
HALKNEY, RAY C., Van Nuys, Cal.
HAMMER, JOHN M., Harrison, N. J.
HANLEY, WILLIAM R., Elkins Park, Pa.
HANSON, BRYAN E., Kankakee, Ill.
HARRIMAN, HUBERT C., New Rochelle, N. Y.
HARBOUN, WILLIAM M., Sharon, Mass.
HARVEY, CURTIS W., Largo, Fla.
HAWKINSON, J. LOWELL, Rockford, Ill.
HAWLEY, LEWIS A., Nova, Ohio
HAYLOCK, HARRY V., Georgetown, Ont., Canada
HEETMANN, PAUL R., Fairfield, Conn.
HELMS, H. D., Dallas, Texas
HENNISS, TIM G., Kingsport, Tenn.
HENRY, KEITH, Rockford, Ill.
HERMAN, GEORGE W., Huntington Sta., N. Y.
HERNANDEZ, ARMANDO R., Mexico D. F., Mexico
HETTEL, JOSEPH A., Rochester, N. Y.
HICKMAN, FURMAN M., Montclair, Cal.
HIGLEY, FORREST N., Liverpool, N. Y.
HILTNER, LEON F., Minneapolis, Minn.
HINTLIAN, CHARLES H., Van Nuys, Cal.
HISEY, ELMER, Bellevue, Wash.
HITCH, S. G. L., Pittsford, N. Y.
HITCHCOCK, EDWARD W., Boston, Mass.
HOEFEL, WILLIAM H., Manheim, Pa.
HOLMES, CHARLES M., No. Hollywood, Cal.
HOROWITZ, JEROME E., Providence, R. I.
HORVATH, THEODORE F., Rochester, N. Y.
HOULE, CLAYTON J. B., Fall River, Mass.
HOWELL, WILLIAM S., Rockford, Ill.
HYLEN, JAMES H., Muskegon, Mich.
INDIHAR, FRANCIS J., Rancho Cordova, Cal.
JARRELL, FRANK W., Huntington, W. Va.
JASPER, THURMAN G. T., Sacramento, Cal.
JAYNES, HOWARD S., Poughkeepsie, N. Y.
JOHNSON, OSCAR E., North Aurora, Ill.
JONES, HARRY L., Mansfield, Ohio
JONES, JOHN D., Watertown, Mass.
JUDSON, JOSEPH, North Hollywood, Cal.
JUVE, RODNEY J., Plymouth, Mich.
KANOFSKY, JACK, Montreal, Que., Canada
KAPHAN, MONROE, Livingstron, N. J.
KENNEY, JOSEPH M., Woodland Hills, Cal.
KENNY, JOHN J., Poughkeepsie, N. Y.
KENT, HOWARD E., Columbus, Ohio
KACHADOORIAN, ARCHIE, Watertown, Mass.
KINDER, NORVIN P., Rockford, Ill.
KING, EDGAR P., Indianapolis, Ind.
KINSLEY, JOHN M., Johnson City, N. Y.
KIRBY, PAUL N., Niagara Falls, N. Y.
KLEIN, ROBERT, Montreal, Que., Canada
KNIGHT, ALLEN G., Palmdale, Cal.
KRAGT, MARVIN N., Elmira, N. Y.
KRYNICKI, RAYMOND G., Riverdale, Ill.
KRYSTYNIAK, IRENE F., Algonquin, Ill.
KUENY, KENNETH E., North Muskegon, Mich.
LA CROIX, RAYMOND J., Pawtucket, R. I.
LA VISTA, LAWRENCE E., Endicott, N. Y.
LAHTI, JOHN T., East Rochester, N. Y.
LAIRD, SAMUEL E., San Fernando, Cal.
LAKE, WILLIAM L., Rochester, N. Y.
LEVY, NATHAN P., Brooklyn, N. Y.
LINDEMANN, KENNETH C., Poughkeepsie, N. Y.
LIPSEY, LESTER B., Bethpage, L.I., N. Y.
LONGSTREET, WILLIS H., Cincinnati, Ohio
LOUDERBACK, LAUREN G., St. Louis, Mo.
LUNDBERG, JOHN S., Rochester, N. Y.
MABRY, DELORD R., Dallas, Tex.
MAHAN, JOSEPH P., Chestnut Hill, Mass.
MAHER, WALTER G., Rochester, N. Y.
MANSFIELD, LAWRENCE D., Saugus, Mass.
MARTIN, ALVIN H., Thousand Oaks, Cal.
MARTIN, CYRUS A., Herndon, Va.
MARTIN, JAMES C., Warren, Ohio
MASSEY, FRANK K., Denison, Tex.
MAY, CHARLES B., Binghamton, N. Y.
MCCALL, ROBERT E. JR., San Fernando, Cal.
MCCARTHY, RICHARD D., Chicago, Ill.
MCGOWAN, WILLIAM R., Poughkeepsie, N. Y.
MCHUGH, DANIEL, Hilton, N.Y.
MCINTYRE, STELLA G., Oklahoma City, Okla.
MCKEE, ROBERT W., Coshocton, Ohio
MCKERCHER, JOHN C., Rockford, Ill.
MEEKER, HARVEY H. JR., Aiea Hghts., Oahu, Hawaii
MEHTA, ADOLF, Burbank, Cal.
MEYER, RAYMOND M., Altadena, Cal.
MICHAELSON, JAMES P., Rialto, Cal.
MIKESELL, CHARLES R., Citrous Heights, Cal.
MILLOR, FOREST L. JR., Oak Ridge, Tenn.
MINER, ARTHUR G., No. Hollywood, Cal.
MITCHELL, CHARLES C. JR., Gulf Breeze, Fla.
MOORE, CHARLES E., Easton, Pa.
MORENO, JUAN CRUZ, Talanepantla, Edo, Mexico
MURPHY, CLARENCE B., Westmount, Que., Canada
MURPHY, EARL W. JR., Ft. Madison, Iowa
NICHOLAS, DONALD E., Akron, Ohio
NICHOLLS, ARTHUR, Hampstead, Que., Canada
NICHOLS, ROBERT J., Lexington, Ky.
NOLET, RICHARD R., Methuen, Mass.
NORTON, CARLA M., Dallas, Texas
O'CONNOR, ROBERT F., Altoona, Pa.
LOMUFO, LEONARD J., Muskegon, Mich.
PANTANO, PHILIP A., Medford, Mass.
PARRO, NEREO R., New York, N. Y.
PARRY, JAMES D., Washington, D. C.
PATTERSON, THOMAS K., Dublin, Ga.
PAULSON, HARVEY V., Minneapolis, Minn.
PAVEY, JAMES C., Wayzata, Minn.
PENROD, JAMES Q., Manitowoc, Wis.
PERRY, ALBERT T., Pensacola, Fla.
PERTSCHUK, DAVID W., Framingham, Mass.
PETRILLO, FELIX L., Wollaston, Mass.
PETROSEWICZ, THOMAS J., Brooklyn, N. Y.
PETRUCELLI, EDWARD A., Bridgeport, Conn.
PETTERSON, HAROLD F., San Jose, Cal.
PIXLEY, HAROLD W., Rochester, N. Y.
PLUMMER, THEODORE E., Rochester, N. Y.
PORCO, DOMINICK, Burbank, Cal.
POULOS, GEORGE F., La Canada, Cal.
POTRATZ, RICHARD F., North St. Paul, Minn.
POWELL, RUSSELL, Culver City, Cal.
PRAH, JOHN D., Lewisburg, Pa.
PRITCHARD, ROBERT A., Reseda, Cal.
PROTASIEWICZ, WILLIAM J., Lancaster, Pa.
QATANI, IBRAHIM A., Providence, R. I.
QUIBELL, R. V., Sunland, Cal.
RAHWYLER, STUART A., Anaheim, Cal.
RALPH, ARTHUR C., Clamorgan, So. Wales, G. B.
RALPH, JAMES E., Galion, Ohio
RANGEL, HECTOR PIMENTEL, Mexico D. F., Mexico
RASKOSKI, FRANK J., Poughkeepsie, N. Y.
RASMUSSEN, TAGE, Birkerod, Denmark
RECHTIN, GLADYS P., Rockford, Ill.
REED, DONALD L., Marblehead, Mass.
REED, EUGENE H., Northridge, Cal.
REEVES, WALTER C., JR., Webster, N. Y.
REID, TOY F., Kingsport, Tenn.
RESINGER, ROBERT E., Lansdale, Pa.
REYES, JAIME MONTOYA, Mexico City, Mexico
RICE, WILLIAM F., Rochester, N. Y.
RINGUETTE, NORMAN A., Plainville, Mass.
ROBERTS, THOMAS W., JR., Newnan, Ga.
ROE, HARRY W., Kenmore, N. Y.
ROGERS, HOWARD F., Rochester, N.Y.
ROWLAND, ALFONSO, Santiago, Chile
RUD, NORMAN E., JR., Minneapolis, Minn.
RUFFNER, JOHN D., Pittsford, N. Y.
RUTEMILLER, HERBERT C., Cleveland, Ohio
RYAN, ANTHONY D., Pte Claire, Que., Canada
SANTOS, JOSEPH T., Somerville, Mass.
SAVULSKI, PAUL A., Milford, Conn.
SCARSCIOTTI, ANTHONY R., Dedham, Mass.
SCHMIDT, ALBERT E., West Millington, N. J.
SCHUTT, RUSSELL O., York, Pa.
SCLAVO, ENRICO R., Mexico D. F., Mexico
SEARLES, ELISHA R., JR., San Diego, Cal.
SEGODNIA, THEODORE, St. Clair Shores, Mich.
SELDNER, ALVIN A., Newtown, Conn.
SHAFFER, KEITH C., Boring, Ore.
SHEA, MICHAEL E., Alhambra, Cal.
SHEINBAUM, STANLEY, No. Hollywood, Cal.
SHEPHERD, LARRY D., Reading, Pa.
SHERMAN, LESLIE A., Elkhart, Ind.
SHERWOOD, RUSSELL, Cedar Rapids, Iowa
SHIFFLETTE, WILLIAM M., Anaheim, Cal.
SHOEMAKER, ROBERT H., Canton, Ohio
SIEBERT, HORST H., Montreal, Que., Canada
SILVER, ALVIN M., Burlington, Mass.
SIMONS, HOWARD B., New Haven, Conn.
SLADE, MELVIN F., Inglewood, Cal.
SLAUGHTER, ROBERT B., JR., Fairport, N. Y.
SMITH, JAMES W., Fairport, N. Y.
SNOWDEN, CLAUDE B., JR., Coggon, Iowa
SORENSEN, LESLIE P., Chicago, Ill.
SOURS, LEON E., Fairport, N. Y.
STAFFORD, ROBERT B., Cumberland, Md.
STREB, CLAYTON J., Rockford, Ill.
SUMMERS, ALVIN G., Sacramento, Cal.
SUMMERS, FRANCIS L., Portland, Ore.
SWIDLER, STEPHEN A., Lynn, Mass.
TEDFORD, ROBERT H., Beverly, Mass.
TERBERG, WILLIAM J., Bellflower, Cal.
THOMSON, MURL H., Mt. Vernon, Iowa
THURMOND, WILLIAM B., Fairport, N. Y.
TIEZZI, ANTHONY A., No. Adams, Mass.
TILBURY, LAWRENCE E., Rockford, Ill.
TOMAZIN, LEONARD S., Wappinger Falls, N. Y.
TORRES, LUIS RANGELL, Mexico D. F., Mexico
TOWNSEND, RALPH A., Riverdale, N. J.
TRAIL, ALEXANDER J., Livingston, N. J.
TRAPP, EUGENE A., Hasbrouck Hgts., N. J.
TREGONING, WILLIAM L., Holbrook, Mass.
TROMP, MARVIN O., Muskegon, Mich.
TROY, WILLIAM F., JR., Brighton, Mass.
TUKEY, JOHN W., Princeton, N. J.
VELTUM, ERWIN G., Westerville, Ohio
VICTOR, BERNARD, Philadelphia, Pa.
WAGNER, EDWIN T., Roselle, Ill.
WALKER, DANIEL D., JR., Henderson, Nev.
WALTUCK, MOREY H., Rochester, N. Y.
WATKINS, KEITH G., Torrance, Cal.
WATT, ROBERT R., Chateauguay Hts., Que., Canada
WATTS, JOHN C., Dallas, Tex.
WAYMACK, RAYMOND A., Richmond, Va.
WEBER, RUSSELL C., JR., Bethlehem, Pa.

Case Histories On Statistical Methods For Quality Control

Series II *(Regression, Correlation and Association)*

$1.00

Prepared by the Metals Technical Committee of the American Society for Quality Control

Published in April 1960 by the American Iron and Steel Institute

This second series of case histories features the use of committee Standard Data. By keeping data constant, the study is focused on comparison of methods.

ASQC, 161 W. Wisconsin Ave. 1-61
Milwaukee 3, Wis.

Please send me ..... copies of Case Histories On Statistical Methods for Quality Control, Series II (Regression, Correlation and Association). Enclosed is a check or money order for $.....

Name .....

Address .....

City..... **Zone**..... **State**.....

Classified Advertising

Positions Wanted: ASQC Members 75¢, non-members $1.50 per line. Minimum space 5 lines, maximum 20 lines (2½ in. high).

Positions Available: $1.50 per line. Minimum 5 lines, maximum 20 lines. Box permissible if desired on maximum size. General advertising rates apply to all display sizes (1/8 page minimum).

38 characters and spaces per line. Replies to box numbers and copy should be addressed to American Society for Quality Control, 161 W. Wisconsin Ave., Milwaukee 3, Wis. Deadline is 22nd of second month preceding publication.

POSITIONS WANTED

BSME, QC Engineer, Advanced SQC study. Experienced in all phases of SQC in mechanical, Electromechanical, and electronic industries. Desire QC Managerial position. Reply to Box 17G1.

Quality Control Supervisor desires Challenging Administrative position in quality control engineering or management, in New Jersey or Metropolitan New York. College degree plus advanced studies in applied statistics. Nine years experience in precision machining and electronics industries, applying the techniques of sampling, control charts, experimental design, quality reporting, quality evaluation and analysis to the solution of manufacturing and design problems. Complete resume available. Please address replies to Box 17G2.

POSITIONS AVAILABLE

QUALITY CONTROL MANAGER
Industrial Plastics Manufacturer—$30,000,000 Annual Sales require man to organize and manage Quality Control Department. 5-10 years experience in statistical quality control in process industries. Graduate Engineer. Paper making, resin or fabrication experience desired. Please reply Box 17U2.

GAGE AND PRECISION TOOL LAB SUPERVISOR
MINIMUM OF 5 YEARS EXPERIENCE supervising control activities concerned with precision measuring instruments and gages. Degree not required but preferable. To work in growing company primarily engaged in missile and propellant industry.

Contact: T. W. Jameson
Amcel Propulsion Inc.
Subsidiary of
Celanese Corp. of America
P.O. Box 3049
Asheville, North Carolina

QUALITY CONTROL ENGINEER
National food processor is seeking a person with strong statistical quality control experience. This man should possess a technical degree and be able to assume responsibility for complete SQC program. Please send complete resume and salary requirement to:

Personnel Manager
Green Giant Company
Le Sueur, Minnesota

SENIOR QUALITY CONTROL ENGINEERS
QUALITY CONTROL ENGINEERS

Are you a bright creative Quality Control Engineer who would like to use his ability in a variety of functions instead of becoming mired in routine? We need uninhibited energetic engineers with 2-6 years of Quality Control experience who aren't afraid to develop their own original ideas and be responsible for carrying them out. Some formal statistical Quality Control training desired. Openings are with both corporate and plant Quality Control Groups of a rapidly expanding major producer of plastic film. For immediate confidential attention, send resume to Box 17U1.

QUALITY CONTROL ENGINEER

Atlantic Research Corporation, an expanding contract R & D company, requires a qualified engineer to assist Head of Quality Control for the division engaged in development and production of mechanical components and products. Position involves establishment of quality standards, preventive and corrective measures for assuring receipt of quality parts from company fabricating shop and vendors.

M.E. or I.E. degree, plus a minimum of three years training and work experience in application of statistical methods, organization of records systems, and inspection techniques, with practical experience in tool design and machine shop analysis desirable.

Please send resume of technical and academic background, age, salary requirements, and professional references to:

Clarence H. Weissenstein, Director
Technical Personnel Recruitment IQC

ATLANTIC RESEARCH CORPORATION

Alexandria, Virginia

(Suburban Washington, D.C. area)

WEIDMAN, REID B., Rochester, N. Y.
WEIMERSKIRCH, ARNOLD M., Excelsior, Minn.
WEISEN, JAMES C., Lititz, Pa.
WENDT, ROBERT R., Niles, Mich.
WICHT, FORREST W., Omaha, Nebr.
WIDDISON, MERRILL J., Hooper, Utah
WILD, LESLIE V., Jr., Crystal, Minn.
WILLIAMS, RAYMOND H., Erie, Pa.
WILLIAMS, RONALD B., Carterville, Ill.
WILLIS, JOHN A., Rosemere, Que., Canada
WILSON, V. KEITH, Chattanooga, Tenn.
WING, GEORGE C., III, Granada Hills, Cal.
WINGARD, MORRIS R., Niagara Falls, N. Y.
WINGER, ANCIL W., Poughkeepsie, N. Y.
WINKIE, JOHN D., Sr., St. Louis Park, Minn.
WOLF, DONALD E., Sunnyvale, Cal.
WOOD, CHARLES C., St. Joseph, Mich.
WYLIE, PAUL A., Jr., Inglewood, Cal.
YOHE, DONALD C., York, Pa.
ZARMSTORF, GEORGE E., Muskegon, Mich.
ZEPP, LEONARD E., York, Pa.
ZIMMER, RUSSELL D., Winchester, Mass.

ADMISSION TO THE GRADE OF MEMBER

(as of October 31, 1960)

ABPLANALP, EDWARD, Burbank, Cal.
ADAMS, JACQUES E., Layton, Utah
ALBIN, ROBERT D., Littleton, Colo.
ALEXANDER, WILEY L., Dayton, Ohio
ANDES, FRED C., Waltham, Mass.
ANGLE, HENRY W., Waynesboro, Pa.
ASHLEY, TOM E., Bourbonnais, Ill.
BADGER, DONALD M., Binghamton, N.Y.
BANTZ DONALD E., River Grove, Ill.
BASKETT, KENNETH C., Brantford, Ont., Canada
BATTERSBY, WILLIAM M., Seattle, Wash.
BENTON, ALAN W., Glen Burnie, Md.
BENTZ, HAROLD R., York, Pa.
BESORE, CALVIN H., Binghamton, N.Y.
BITTERMAN, CHESTER A. Jr., Mt. Joy, Pa.
BLAIR, DONALD, Hillsboro, N.H.
BLAISDELL, HOWARD W., Lyons, N.Y.
BOASE, JOHN R., Rockford, Ill.
BOESE, RALPH W., Mansfield, Ohio
BORGMAN, JAMES R., Coopersburg, Pa.
BOSWORTH, STANLEY G., Pasadena, Cal.
BOUSHAY, HOWARD J., Milford, Conn.
BRANIN, GEORGE J., Pennsauken, N.J.
BRESENHAM, JACK E., San Jose, Cal.
BROMET, ALFRED, Olivette, Mo.
BRYAN, NORMAN C., Parchment, Mich.
BULLOCK, THOMAS E., Evansville, Ind.
BURGAMASTER, EDWARD A. Jr., Feeding Hills, Mass.
BURGER, GORDON A., Newburyport, Mass.
BURGETT, MILBREY O., Avon, Conn.
BURKE, EDWARD M., Lenox, Mass.
CAIN, CLIFFORD G., Springfield, Mo.
CAMERON, DUNCAN E., Pittsford, N.Y.
CARLSON, JULES S., San Diego, Cal.
CARTER, ANTHONY V., Ft. Worth, Texas
CAW, FRANCIS, Kansas City, Mo.
CHAPPELL, BUDDIE G., Albuquerque, N.M.
CHARBONEAU, NORMAN J., Endwell, N.Y.
CHARLES, BILLY E., Cincinnati, Ohio
CHATHAM, MARION W., Endicott, N.Y.
CLARK, MORTON J., Dalton, Mass.
CLOSE, ALBERT L., Stamford, Conn.
COLE, JAMES E., Littleton, Colo.
CORNELIUS, E. E., Overland Park, Kan.
CRAIG, ELLIS M., North Hollywood, Cal.
CREAGER, RICHARD C., Milwaukee, Wis.
CROMPTON, WALTER H., Horseheads, N.Y.
DAVIES, LESLIE M., Utica, N.Y.
DAVIS, RICHARD R., Arlington, Cal.
DE RING, WARREN H., Newark, N.J.
DENNIS, WILLIAM S. Jr., West Covina, Cal.
DIETZ, JOEL P., Winthrop, Mass.
DODD, RICHARD B., Fort Worth, Texas
DODGE, ERNEST H., Collinsville, Conn.
DODSON, THOMAS L., Hayward, Cal.
DOMAINGUE, HOMER T., Springfield, Mass.
DONNELLY, JAMES E., Everett, Mass.
DROBINA, GEORGE P., Franklin Park, Ill.
EDGAR, DON D., Fort Worth, Texas
EISENEISEN, JAMES C., Milwaukee, Wis.
FENSTERMAKER, GLENN O., Warren, Ohio
FEURST, ERNEST C., Chicago, Ill.
FLANDERS, ALBERT C., St. Clairsville, Ohio
FLEMING, GEORGE W., Cincinnati, Ohio
FOLSOM, DAN P., Orlando, Fla.
FORMAN, HOWELL N. Jr., Dallas, Texas
FOX, RICHARD M., Yardley, Pa.
FRANK, HERBERT C., Bettendorf, Iowa
FRANKS, THEODORE W., Chicago, Ill.
FUJII, KENICHI, Hyogo, Japan
GAILITIS, JAKOB, East Lansing, Mich.
GARBIN, ALBERT J., Springfield, Mo.
GARDINER, THOMAS R., Piedmont, Cal.
GEELHAAR, JOHN G., Baltimore, Md.
GEHLHAUSEN, JOSEPH B., Rockford, Ill.
GEORGE, PAUL C., Minneapolis, Minn.
GHOLSON, RICHARD D., Kansas City, Mo.
GORGAS, WALTER E., New Brighton, Pa.
GRAGERT, ELMER O., Grandview, Mo.
GRIBBON, JOHN A., Pittsfield, Mass.
GRIMWOOD, JAMES E., Richmond, Ind.
GURNEY, ROBERT F., Rochester, N.Y.
GUTIERREZ, HECTOR P., Zacadu Mich, Mexico
HALL, JAMES F., Grandview, Mo.
HALL, TERRELL L. Jr., Fort Worth, Texas
HAMBY, VERDEN W., Berwyn, Ill.
HAMILTON, JACK W., Ft. Worth, Texas

JOB OPPORTUNITIES

in

Quality and Reliability

If you are ready to move up the ladder, we can place you in a position with growth potential. We are the only agency specializing in quality control and reliability. We offer nationwide coverage, with fees paid by employers. Register now.

Quality Control
Personnel Service
267 Hawthorne St.
Malden, Mass.

Employer job listings welcomed

QUALITY CONTROL STATISTICIAN

Research position for a trained statistician with 2-3 years experience in statistical quality control. Work will involve the application of statistical quality control techniques to the manufacture of solid propellant rocket fuel. Also included will be statistical design of experiments and analysis of test data.

Send resume including history of earnings to Stephen L. Robinson,

BOX X56

Thiokol
CHEMICAL CORPORATION
UTAH DIVISION
Personnel Offices: 120 South Main St., Brigham City, Utah

HAMLIN, WALTER C., Yalesville, Conn.
HARDY, SAIE E., Washington, D.C.
HEIMLICH, JOHN C., Tarrytown, N.Y.
HILCHEY, ANTON F., Burbank, Cal.
HILER, MAX A., Plain City, Ohio
HILL, ROBERT D., Lawrence, Kansas
HITZEMAN, RICHARD R., Columbus, Ohio
HODGSON, RONALD T., Montreal, Que., Can.
HORNER, C. GLEN, Muskegon, Mich.
HOWARD, ARTHUR W., Chelmsford, Mass.
HUBBS, CHARLES P., Owensboro, Ky.
HUNTER, JOHN F., Grosse Pointe, Mich.
HUPRICH, CARL A., Kalamazoo, Mich.
HUTMACHER, DONALD L., Denver, Colo.
INGRAM, HARRY E., Mohnton, Pa.
ISERMAN, RICHARD A., Clifton Heights, Pa.
ISHIO, NOBORU, Tokyo, Japan
JAMES, ISLWYN, Glendale, Cal.
JAMES, NEVILLE W., Philadelphia, Pa.
KAEMPFFE, FREDERICK A. Canandaigua, N.Y.
KAUF, PAUL E., Mansfield, Ohio
KEIL, CHARLES C. II, La Fayette, Ohio
KELLEY, JOHN T., Adams, Mass.
KIMBRELL, WILLIAM R., Kansas City, Mo.
KIRK, VINCENT P., Albuquerque, N.M.
KOEHL, GEORGE F., West Covina, Cal.
KNERR, CARL W., Quakertown, Pa.
KOCH, JOHN D., Parkersburg, W. Va.
KOLSTEDT, DONALD J., Bellwood, Ill.
KONOPKA, ANDREW C., North Adams, Mass.
KUNERT, ROBERT N., Overland Park, Kans.
LAEGREID, SIGBJORN, Seattle, Wash.
LEARY, FRANCIS X., Gardena, Cal.
LEHMAN, ROY E., Carlisle, Pa.
LEHNER, CHARLES C., New York, N.Y.
LEWIS, FRANK, London, Ont., Canada
LEWIS, JAMES T., North Adams, Mass.
LIEBD, ROBERT H., Sunset, Utah
LORENZO, FRED H. JR., Kansas City, Mo.
LORTSCHER, DONALD B., Kansas City, Mo.
LUSSIER, WILFRED L., Pittsfield, Mass.
MAREK, ROBERT F., Prior Lake, Minn.
MAURER, BEN F. F., Reading, Pa.
MAY, JAMES W. SR., Binghamton, N.Y.
MAYER, HENRY, Boston, Mass.
MCCAFFREY, EDWARD F., North Adams, Mass.
MCCANN, JOHN E., Palo Alto, Cal.
MCCRAY, CARLETON T., Muncie, Ind.
MCDERMOTT, WILLIAM B., Tulsa, Okla.
MCGINLEY, JOHN, Lima, Ohio
MCGUIRK, JOSEPH B., Largo, Fla.
MCMACKIN, THEODORE M., Hollywood, Cal.
MEISSNER, DONALD E., Covina, Cal.
MELL, HAROLD D., Arlington, Texas
MEYER, JOSEPH S., Sepulveda, Cal.
MILLER, J. E., Hickman Mills, Mo.
MILLER, MERL J., Kansas City, Kans.
MILLER, ROBERT E., Towson, Md.
MILLER, THOMAS J., Elmwood, Conn.
MINERVINO, RALPH C., Waterbury, Conn.
MITTELSTADT, DONALD R., Milwaukee, Wis.
MIZUNO, MINORU, Kawasaki, Japan
MOLL, WILLIAM A., Toledo, Ohio
MONASHKIN, MERIL R., Danbury, Conn.
MONTGOMERY, TRAVIS Y., Pomona, Cal.
MOORE, DOLORES A., San Diego, Cal.
MORELLI, ANDREW N., Ridgefield, Conn.
MULLER, ROBERT W., Mountain View, Cal.
MURPHY, CORNELIUS M., Spring Valley, N.Y.
MURTAGH, FRANCIS P., Syracuse, N.Y.
NAGAO, YUTAKA, Kitajima, Tokushima, Japan
NELSON, JOHN E., Royal Oak, Mich.
NEWELL, FRANCIS M., Kanass City, Mo.
NEY, GEORGE W., Rockford, Ill.
MISHIOKA, TAKEO, Tokyo, Japan
NOLAN, JOHN M., Wichita, Kansas
NORTH, ROBERT A., West Acton, Mass.
O'FALLON, RICHARD J., Minneapolis, Minn.
O'GRADY, WILLIAM J., Clay, N.Y.
O'LEARY, JEROMIAH M., Niagara Falls, N.Y.
OEHLER, WILLIAM JR., South Hadley, Mass.
OGLESBY, RALPH E., Clearwater, Fla.
OKAZAKI, KENJI, Kanagawa, Japan
OLSON, WILMER, Fort Worth, Texas
OOM, JAMES L., Grand Rapids, Mich.
ORD, EDWARD, Danville, Cal.
PARKE, THOMAS V., La Habra, Cal.
PASTRANA, ALEXANDER, Santa Clara, Cal.
PELL, MURRAY K., St. Thomas, Ont. Canada
PHELPS, JOHN E., Derby, Colo.
PONZINI, RICHARD R., Beverly, Mass.
POTTER, CHARLES L. JR., Poughkeepsie, N.Y.
POWELL, FRANK G., Pensacola, Fla.
RAPPAPORT, ERLE J., Washington, D.C.
REA, LAWRENCE F., North Syracuse, N.Y.
REED, GEORGE T., Azle, Texas
REHBERG, GEORGE G. JR., Rochester, N.Y.
RENAUD, CHARLES E., Evansville, Ind.
RICHARDSON, FRANCIS D., Blue Springs, Mo.
RIDER, DUDLEY B., Baie d Urfe, Que. Can.
RIMKUS, ROBERT E., Pasadena, Texas
ROBA, ROY C., Moline, Ill.
ROBERTS, JAMES L. JR., Dalton, Mass.
RODGERS, CHARLES A., Metuchen, N.J.
RODMAN, DAVID B., Pittsfield, Mass.
ROOT, JAMES E., Philadelphia, Pa.
ROSE, WALTER B., Syosset, L.I., N.Y.
RUGGLES, LESLIE E., La Puente, Cal.
RUMERY, GLEN A., Knoxville, Tenn.
RUPPERT, ROBERT E., Prairie Village, Kans.
SAGON, JOHN E., Oshkosh, Wis.
SALHOFF, DONALD R., Toledo, Ohio
SATTRO, RICHARD L., San Diego, Cal.
SCHICK, HAROLD P., Bluffton, Ohio
SCHILLER, P. WILSON, Syracuse, N.Y.
SCHMITT, HEINZ W., Albuquerque, N.M.

QUALITY CONTROL MANAGER

Required by a LEADING PAPER BOX MANUFACTURING ORGANIZATION.

Candidate must meet the following requirements:

—Bachelor's degree in Science (Major in Chemistry preferable)

—Good knowledge of Paper and Cardboard

—At least 2 years experience in Q.C.

Candidate must be bilingual, possess a leading personality and show special abilities for research. Seriousness and initiative are essential.

Permanent position — Attractive salary — Group Insurance — Pension Plan.

Any person who fulfills the above requirements may apply stating: education—experience and qualifications.

P.O. Box 1159
Montreal 3

Schmitt, John R., Owensboro, Ky.
Schnakenberg, George H. F., Plainfield, Ind.
Schwanat, W. Robert, Decatur, Ill.
Seaman, Otto J., Burbank, Cal.
Seatter, James K., Milwaukee, Wis.
Secora, Lawrence P., Sun Valley, Cal.
Semple, Daniel J., Lima, Ohio
Shapiro, Isidore T., Levittown, Pa.
Sheer, Marshall, Marblehead, Mass.
Sheffler, Robert J., Roselle, N.J.
Shelton, Hubert A. Jr., Kingsport, Tenn.
Sheppard, John W. Sr., National City, Cal.
Shiffler, Paul M., Elysburg, Pa.
Showalter, George H., Jim Thorpe, Pa.
Sill, Kenneth B., Sherman Oaks, Cal.
Simpson, William L., Kingsport, Tenn.
Sitoski, Stanley J., Hazleton, Pa.
Sloughfy, C. Arthur, Philadelphia, Pa.
Smith, Donald R., Anaheim, Cal.
Smith, Raymond E., Tyringham, Mass.
Smith, Robert E., Hellam, Pa.
Sowatsky, Richard B., Muncie, Ind.
Spacinsky, John J., Costa Mesa, Cal.
Spoor, Milton R., Barrington, Ill.
Stacconi, Felix A., Eddwell, N.Y.
Stancato, O. L., Denver, Colo.
Stathis, Andrew W., Niagara Falls, N.Y.
Straiter, Dennis F., Washington, D.C.
Swab, James J., Birdsboro, Pa.
Szpila, Eugene J., Adams, Mass.
Takach, Gasper G., Glendora, Cal.
Takasy, Louis A., Dearborn, Mich.
Takatu, Shiro, Nakago Niigata, Japan
Tame, Takeshi, Otake City, Hiroshima, Japan
Testa, Henry R., North Adams, Mass.
Thomas, John L., San Diego, Cal.
Thompson, George H., Archie, Mo.
Tiedeman, Walter T. Jr., Evansville, Ind.
Troiano, Frank A., Baltimore, Md.
Utley, Thomas G., Canoga Park, Cal.
Van Domelen, John G., Kalamazoo, Mich.
Vaughn, John L. II, Kingsport, Tenn.
Viljanen, Kent E., Lee, Mass.
Von Alven, William H., Arlington, Va.
Wadland, Robert L., Melrose, Mass.
Wagner, Francis J., Denton, Texas
Wagner, Walter K., Albuquerque, N.M.
Walker, Lawrence, Ilford Essex, Eng.
Walker, Maury K., Fair Oaks, Cal.
Wallace, Will H., Carterville, Ill.
Wannamaker, William D., Louisville, Ky.
Ward, Anthony J., Philadelphia, Pa.
Watts, Des, Sierra Madre, Cal.
Weber, Mathias, Westerville, Ohio
Welch, Van D., Binghamton, N.Y.
Wend, John P., Pittsfield, Mass.
Whitney, Robert B., Lancaster, Pa.
Wietlake, Allan W., East Hazelcrest, Ill.
Wilder, Eleanor W., Asheville, N.C.
Wilensky, Hugh B., Adelphi, Md.
Wilson, Charles D., Clarksburg, Mass.
Wilson, Jack, Fort Worth, Texas
Wilson, John S., San Diego, Cal.
Winter, John G., Hughsonville, N.Y.
Wykart, Harold E. Jr., Upland, Cal.
Yost, Herman E., Poughkeepsie, N.Y.
Young, Sai K., Los Angeles, Cal.

ADMISSIONS TO THE GRADE OF ASSOCIATE MEMBER

(As of September 30, 1960)

Akens, Anne E., York, Pa.
Balmer, Ray S., Manheim, Pa.
Becker, Earl F., Pawtucket, R. I.
Bergsma, R. Jack, Holland, Mich.
Bowman, Nathan B., Panorama City, Cal.
Brook, Cyril R., Maplewood, N. J.
Budd, Robert O., Richland, Wash.
Bull, Lowell R., Windsor, Pa.
Burnahm, Peter W., Detroit, Mich.
Campbell, Sam A., Minneapolis, Minn.
Case, John H., Muskegon, Mich.
Childress, Dan O., Columbus, Ohio
Choate, Frederick F., Springfield, Mass.
Colson, Stanley R., Bellevue, Wash.
Core, Harry L., New York, N. Y.
Cragin, John, Glendale, Cal.
Crawford, Leo E., San Diego, Cal.
Crowe, Robert E., Chicago, Ill.
Crowley, Joseph I., Dorchester, Mass.
Day, Lowell C., San Diego, Cal.
Engber, Martin W., Wichita, Kans.
Eveland, Lloyd, Tulsa, Okla.
Exter, Irving M., Bronx, N. Y.
Ferguson, John, Dartmouth, N. S., Canada
Finrow, Vernon H., Sunnyvale, Cal.
Fisher, William R., Muskegon, Mich.
Freeman, Fred E., Galt Ont., Canada
Fuller, Henry J., Jr., Ludlow, Mass.
Gabrey, Joseph A., Providence, R. I.
Glaser, Arnold W., Cedar Rapids, Iowa
Gorgas, Robert L., Riesel, Texas
Guglielmi, Vito, Plainfield, Conn.
Hanshaw, Gary K., North Kenova, Ohio
Heinrich, Harry H., New London, Wis.
Hoeft, Wayne L., Minneapolis, Minn.
Holmes, Glenwood F., Toledo, Ohio
Hunt, John W., Hartford, Conn.
Ingle, Richard D., Riverside, R. I.
Kern, Jack W., Lancaster, Cal.
Kirkley, Norma J., Marion, Iowa
Koomen, Karl C., Leola, Pa.
Krysowaty, Joseph S., Chicago, Ill.
Kysel, Joseph P., River Edge, N. J.
Leady, James W., Toledo, Ohio
Lopez, Mike J., Santa Maria, Cal.
Madden, Edward C., Springfield, Mo.
Martin, Albert F., Roselle, N. J.
McEachern, Stewart D., Toronto Ont., Canada
McReynolds, Howard L., Kansas City, Mo.
Melton, Alva B., Holland, Mich.
Mendell, David, Orangeburg, N. Y.
Miller, Lawrence K., Chicago, Ill.
Mullins, Elvie L., Agoura, Cal.
Mummert, Ray G., York, Pa.
Myer, Robert, Kirkland, Wash.
Nelson, Louis E., Muskegon, Mich.
Nelson, Theodore W., Milwaukee, Wis.
Peck, Lawrence F., Janesville, Wis.
Perkins, J. Wayne, Orange, Conn.
Pharr, David L., Tulsa, Okla.
Pluck, Richard, Lansdale, Pa.
Posurka, Philip D., Grand Prairie, Texas
Racca, William H., Riverside, R.I.
Randall, Courtland W., Jr., Lincoln, R.I.
Reisman, Barry B., Carmichael, Cal.
Rentschler, Donna J., Shaker Hts., Ohio
Roland, Gerald H., Elizabethtown, Pa.
Rossi, Jean R., W. Warwick, R.I.
Sampson, Everett B., Swansea, Mass.
Small, Virginia L., San Gabriel, Cal.
Solan, John F., Lynn, Mass.
Spano, Carmelo, Kingston, N.Y.
Spalding, Thomas R., Hudson, Ohio
Sterner, Jerry W., York, Pa.
Taber, Bruce E., St. Louis Park, Minn.
Thomas, Robert L., Hyde Park, N.Y.
Uhl, John P., Arlington, Va.
Urso, John A., Toledo, Ohio
Vanderwort, Harry A., San Diego, Cal.
Villicana, Miguel Rangel, Mexico D.F. Mexico
Vincent, Edward G., Buena Park, Cal.
Viscione, Joseph S., Bristol, R.I.
Walker, Fred L., Lufkin, Texas
Wasserman, Paul F., Esmond, R.I.
Weaander, Alexander J., Saginaw, Mich.
Wickstrom, Warren A., Stevens Point, Wis.
Wilson, Virgil, Santa Maria, Cal.

(as of October 31, 1960)

Armstrong, John B., Broadview, Ill.
Bare, Billy R., Glen Rock, Pa.
Bell, Kenneth D., Uniopolis, Ohio
Bleistein, A. J., Holtwood, Pa.
Born, Gene, Lima, Ohio
Breda, Anthony, Jacksonville, Fla.
Bunnell, Norman R., Wyomissing, Pa.
Burke, Daniel C., Chicago, Ill.
Chow, Bryant, New Brunswick, N.J.
Clabough, Kenneth L., Scranton, Pa.
Clady, Howard J., New Washington, Ohio
Clark, James Jr., Herrod, Ohio
Collier, Orla E., La Fayette, Ohio
Dare, Glen M. Jr., Okeana, Ohio
De Witt, Allen M., Bethlehem, Pa.
Dennison, Charles R., Seattle, Wash.
Dukro, Clement J., Lima, Ohio
Eckenrode, Thomas B., Lancaster, Pa.
Elkins, Clinton E., Arvada, Colo.
Emrich, William F., Ontario, Cal.
Evans, Wrenie, Ft. Worth, Texas
Gatto, Vincent R., Cuyahoga Falls, Ohio
German, Paul A., Glandorf, Ohio
Goldenberg, Leonard C., Flushing, N.Y.
Goudreau, Roger J., Westfield, Mass.
Gregan, John, Upland, Cal.
Hall, Donald D., Springfield, Mo.
Harlan, Robert O., Chicago, Ill.
Haskell, Ronald J., Minneapolis, Minn.
Hott, Gordon, E., Deerfield, Ill.
Hullinger Robert A., Lima, Ohio
Hunt, Fred D., Fostoria, Ohio
Jolliff, Donald R., La Fayette, Ohio
Jones, Nolan M. Jr., Columbus Grove, Ohio
Juda, Emil M., Hartford, Conn.
Kazmierski, Stanley, Straford, Conn.
Keiser, John H. Jr., Kutztown, Pa.
Koritzke, Marger O., Woodland Hills, Cal.
Krell, Donald E., Tamaqua, Pa.
Kroeker, Edwin H., Ivyland, Pa.
Kropp, Robert C., Tamaqua, Pa.
Leach, Gayle M., New Washington, Ohio
Maas, Richard A., Ottawa, Ohio
May, Andrew J., Queens, N.Y.
McCormick, Clifford B., Springfield, Mo.
Minnich, Jack E., York, Pa.
Moore, William R., Wichita, Kansas
Mudd, Alphonsus L., Denver, Colo.
Palmer, Woodbry, Thornton, Colo.
Parks, Dale D., Lima, Ohio
Pealey, Wallace L., Zoarville, Ohio
Perry, Wilfred E., Wethersfield, Conn.
Ptaszkowski, Frank J., Summit Hill, Pa.
Raibaldi, Donald J., Staten Island, N.Y.
Range, George E., Jonesboro, Tenn.
Reed, Edwin V., Bovertown, Pa.
Regan, Richard F., Scranton, Pa.
Robertshaw, John N., Tamaqua, Pa.
Salter, Duane B., Littleton, Colo.
Scadova, Donald J., Hillsboro, N.H.
Smith, Harold J., Glen Rock, Pa.
Solomon, Harold H., Bristol, Conn.
Summerton, Ernest L., Akron, Ohio
Tarbassian, Vartkess H., Boston, Mass.
Todd, Stephen T., Denver, Colo.
Tynan, Bruce H., Easton, Pa.
Voss, Robert J., Buffalo, N.Y.
Ward, James C., New Toronto, Ont. Can.
Ward, Ronald L., Ada, Ohio
Werling, Richard W., Waynesfield, Ohio
Whealer, Robert A., West Reading, Pa.
Wickard, Glenn E., Kenton, Ohio
Wojcik, Donald R., Chicago, Ill.
Yingling, Allen D., Rockford, Ill.
Zupko, Michael J., Tamaqua, Pa.

STUDENT ENROLLMENTS

(As of September 30, 1960)

Reddy, M. P., Chicago, Ill.

(as of October 31, 1960)

Anderson, Glenn L., Chicago, Ill.
Banton, James F., Glen Ellyn, Ill.
Belovicz, Meyer W., Chicago, Ill.
Candy, Thomas R., Chicago, Ill.
Davenport, William P., Glendale, Ariz.
Marrow, James H., Minneapolis, Minn.
Zeccardi, Joseph J., New York, N.Y.

Southwest Reliability Training Course

Thirty-four registrants from all parts of the United States (and one from Japan) participated in the Southwest session of the IRE/PGRQC ASQC Electronics Division Reliability Training Course Oct. 10-15 at Lake Texoma Lodge, north of the Dallas-Fort Worth area.

Instructors were Thomas A. Budne and Harmon S. Bayer, both professional quality control and reliability consultants and veterans of several past sessions of the course. Harry W. Shifflett, Texas Instruments, was chairman of the local committee.

In addition to the formal classroom lectures and discussions on reliability theory, applications, and management, an evening program included guests speakers who lectured and led discussions on various allied topics.

Included in this program was the Air Force Reliability Story, presented by R. C. Littler and H. J. Kuns, Wright-Patterson AFB, Ohio.

Local area speakers included M. R. Seldon, Chance Vought Aircraft, on Reliability Aspects of Quality Control; A. R. Gardsbane, Temco Electronics, on In-Plant Reliability Training; Glen Owen, Convair-Fort Worth, on Field Failure Reporting Systems, and K. W. Davidson, Texas Instruments, on Component Reliability Measurement and Demonstration.

Information on future presentations of the Reliability Training Course may be obtained from the course registrar, A. R. Roddey, 1521 Barbour Road, Falls Church, Va.

clinics, conferences, and courses

JANUARY

. . . 8—Measurement Series on eight consecutive Monday evenings at the Wentworth Institute, sponsored by the Boston ASQC section, contact Robert Fabian, 256 Plain St., Rockland, Mass.

. . . 9—Seven week intermediate QC course sponsored by the Greater Muskegon ASQC section. Contact William A. Hume, 1548 Montague, Muskegon, Mich.

. . . 9-11—Seventh National Symposium on Reliability and QC, Bellevue-Stratford Hotel, Philadelphia, Pa., sponsored by the IRE, AIEE, EIA, and ASQC. Contact R. L. Schwerin, vice chairman, publicity committee, ACF Electronics Div., ACF Industries, Inc., 11 Park Place, Paramus, N.J.

. . . 11-12—Two Day National Seminar on Quality Control, St. Louis, Mo., co-sponsored by ASQC and ASTME, contact ASTME, 10700 Puritan, Detroit 38, Mich.

. . . 16-18—Fifth ASQC Workshop-Seminar, Penn Sheraton Hotel, Pittsburgh, Pa., Paul C. Clifford, director, professor at Montclair State College. Address inquiries to: Fifth ASQC Workshop-Seminar, ASQC, 161 W. Wisconsin Ave., Milwaukee 3, Wis.

. . . 16-19—ISA Winter Instrument-Automation Conference & Exhibit, Sheraton-Jefferson Hotel and Kiel Auditorium, St. Louis, Mo., contact William H. Kushnick, executive director, ISA, 313 Sixth Ave., Pittsburgh 22, Pa.

. . . 23—Ten day 1961 Engineering and Management Course, UCLA campus, contact Reno R. Cole, coordinator, College of Engineering, University of California, Los Angeles 24, Calif.

. . . 24-27—17th Annual Technical Conference of the Society of Plastics Engineers, Shoreham Hotel, Washington, D.C. Contact SPE, 65 Prospect St., Stamford, Conn.

. . . 26—One Day Seminar sponsored by the Hartford ASQC section at the Hotel Bond, Hartford, Conn. The speaker will be Dorian Shainin, Fellow ASQC, and vice president, Rath and Strong, Industrial Consultants. He will describe "Thirteen Ways to Reduce Inherent Avoidable Costs." Contact C. Chilone, Anemostat Corporation of America, 15 Frower St., Hartford, Conn.

. . . 28—Annual Inland Empire One Day Conference, Mission Inn, Riverside, Calif., sponsored by the San Bernardino ASQC section. Four simultaneous sessions will cover reliability, advanced statistical methods, process control and inspection work shop. Speakers will include Dr. I. West, Dr. H. Romig, Dr. Kuhn, W. M. Ferguson and L. Gideon. Contact Harold Batchelor, General Electric Co., Ontario, Calif., telephone YUkon 6-3861, Ext. 209.

. . . 28—10th Annual Quality Control Conference, Cincinnati, Ohio, sponsored by ASQC Cincinnati and Hamilton-Middletown sections. Topics include management relations to QC; QC in the bulk industries (food, chemicals, paper, etc.) and QC in mechanical and metal industries (hard goods, electronics, etc.), contact Hubert T. Cornish, 7276 Rita Lane, Cincinnati 43, Ohio.

. . . 30-Feb. 9—Fourteenth annual basic short course in QC by Statistical Methods presented by the Division of University Extension, University of Illinois, Urbana, Ill. The course is designed for those in the areas of design, production, procurement, management, quality control, and inspection. Contact Prof. John A. Henry, Mechanical Engineering Laboratory, University of Illinois, Urbana, Ill.

. . . 31—Sixteen week advanced course on statistical principles, rm. 213, University of Illinois, Navy Pier, from 7 to 10 p.m. Eligibility for enrollment can be established by consultation with the instructors—Dr. Marjorie L. Sutherland, Sutherland-Jacobson and Associates, and Mae-Goodwin Tarver, Continental Can Co. Those persons who satisfactorily completed the 1960 basic QC course are automatically eligible. The course is limited to 40 students and the fee will be nominal. Contact Miss Tarver at VI 6-7000, Ext. 450.

FEBRUARY

. . . 4—Chemical Division Conference, Seton Hall University, South Orange, N.J. Luncheon speaker will be Dr. Ellis R. Ott, Rutgers—The State University, New Brunswick, N.J., with "Applications of Statistics in the Chemical Industry." The program, which will open at 9:30 a.m., will include three panels—a sampling of elementary ideas in statistics; computer applications, analog and digital, and experimental design. Speakers include Dr. Churchill Eisenhart and Dr. J. Youden, National Bureau of Standards; Dr. Ott and Dr. Mason E. Wescott, Rutgers—The State University; Dr. Grant Wernimont, Eastman Kodak Co., and Consultants Cuthbert Daniel and Tom Budne.

. . . 9—Thinking Tools for Engineers Series for ten consecutive Tuesday evenings, location to be announced, sponsored by the Boston ASQC section, contact Robert Fabian, 256 Plain St., Rockland, Mass.

. . . 11—Annual ASQC Automotive Division Conference, Rackman Memorial Bldg., 100 Farnsworth Ave., Detroit 2, Mich. Contact Steve Adams, 18469 Dolores Ave., Lathrup Village, Michigan.

. . . 14—One Day Clinic at the Hotel Lowry, St. Paul, Minn., sponsored by the Minnesota ASQC section, contact Kenneth L. Sundeen, Minneapolis Honeywell Regulator Co., 2753 4th Ave. South, Minneapolis, Minn.

. . . 14-16—Second Annual Symposium on Nondestructive Testing of Aircraft and Missile Components (unclassified), Gunter Hotel, San Antonio, Texas, sponsored by South Texas section of the Society for Nondestructive Testing, Inc., and Southwest Research Institute. Contact R. B. Wangler, general chairman, Southwest Research Institute, Box 2296, San Antonio, Texas.

. . . 18-20—Eleventh Annual Textile Division Conference, Clemson House, Clemson, S.C., contact R. G. Mitchell, International Latex Corp., Dover, Del.

. . . 20-22—1961 Conference for Business and Industry, Seattle, Wash., sponsored by the American Management Association. Contact AMA, 1515 Broadway, Times Square, New York 36, N. Y.

. . . 22—Second Annual Reliability Symposium, Statler Hilton Hotel, Los Angeles, Calif., sponsored by the Los Angeles ASQC section. For additional information contact Jack Lancaster, AMC Ballistic Missile Center (LBPQ) AF Unit Post Office, Los Angeles 45, Calif. Telephone ORchard 0-1444, Ext. 1153, or Steve Kozich, American Electronics, 1598 East Ross Ave., Fullerton, Calif. Telephone TRojan 1-3020 or MAdison 5-7192. The Conference Transaction will be printed and copies can be reserved by writing to Arnold Rothstein, Space Technology Laboratories, 5800 Arbor Vitae, Los Angeles 45, Calif. Telephone SPring 6-1311, Ext. 1002.

. . . 20-23—46th Annual Meeting of the Technical Association of the Pulp and Paper Industry, Hotel Commodore, New York, N.Y. Contact TAPPI, 360 Lexington Ave., New York 17, New York.

MARCH

. . . 5—Fifth Annual Dayton QC Conference, Biltmore Hotel, Dayton, Ohio. Contact John E. Condon, National Cash Register Co., Main and K Streets, Dayton, Ohio.

. . . 5-9—Sixth Annual Gas Turbine Conference sponsored jointly by the Gas Turbine Power Division of the American Society of Mechanical Engineers and the U.S. Department of Defense at the Shoreham Hotel and the Pentagon, Washington, D.C. Contact ASME, Meetings Department, 29 West 39th St., New York 18, New York.

. . . 6-8—Data Processing Conference, Statler Hilton Hotel, New York City, sponsored by the American Management Association. Contact AMA, 1515 Broadway, Times Square, New York 36, N. Y.

. . . 8-10—11th Annual ISA Conference on Instrumentation for the Iron and Steel Industry, Roosevelt Hotel, Pittsburgh, Pa. Contact Richard R. Webster, Jones & Laughlin Steel Corp., Research Laboratory, 900 Agnew Ave., Pittsburgh 30, Pa.

. . . 10—Joint ASQC-AIIE Seminar "The Breakthrough to Higher Levels of Performance," Western Skies Hotel, Albuquerque, N. M. Contact Joe McDowell, 604 Amherst Dr., S. E., Albuquerque, N.M.

. . . 11—All Day Annual QC Forum sponsored by the Toronto ASQC section, contact G. E. Culver, 78 Hearst Circle, Toronto, Ontario, Canada.

. . . **17—Eighth Annual Industrial Clinic for Quality Control sponsored by the Milwaukee ASQC section. Topics include foods and allied industries, inspection and gaging, management, and general interest, plus a top-notch series of training sessions. Contact Riley Kelhofer, P. O. Box 1204, Milwaukee 1, Wis.**

. . . **20-24**—Twelfth Western Metal Congress and Exposition, Pan-Pacific Auditorium, Los Angeles, Calif., sponsored by American Society for Metals, Metals Park (Novelty), Ohio.

. . . **27-31**—3rd Symposium on Temperature—Its Measurement and Control in Science and Industry, Veterans' Memorial Hall and Deshler-Hilton Hotel, Columbus, Ohio. Sponsored by ISA, American Institute of Physics, and National Bureau of Standards. Contact ISA, 313 Sixth Ave., Pittsburgh 22, Pa.

APRIL

. . . **6-8—Sixth ASQC Workshop-Seminar, Hotel Roosevelt, New York City, Paul C. Clifford, director, professer at Montclair State College. Address inquiries to: Sixth ASQC Workshop-Seminar, ASQC, 161 W. Wisconsin Ave., Milwaukee 3, Wis.**

. . . **12-13**—Third Symposium on Information and Decision Processes, Purdue University, Lafayette, Ind. Contact Purdue University.

. . . **17-19**—7th National ISA Symposium on Instrumental Methods of Analysis, Shamrock-Hilton Hotel, Houston, Texas. Contact ISA, 313 Sixth Ave., Pittsburgh 22, Pa.

. . . **23-May 5**—Advanced QC Course, University of Connecticut, Storrs, Conn., contact Richard M. Story, Jr., University of Connecticut, Storrs, Connecticut.

. . . **30-May 4**—7th National Aero-Space Instrumentation Symposium, Adolphus Hotel, Dallas, Texas. Contact W. J. Gabriel, Group Engineer, Convair Division, General Dynamics Corp., Fort Worth, Texas.

MAY

. . . **9-11**—1961 Western Joint Computer Conference, Ambassador Hotel, Los Angeles, Calif. Papers on systems, applications and circuitry for both digital and analog computers. Submit summaries of papers by Dec. 15 to C. T. Leondes, associate professor of engineering, Department of Engineering, University of California, Los Angeles 24, Calif.

. . . **19-26**—Basic QC Course for the Textile Industry, North Carolina State College, Raleigh, N.C. Contact David B. Stansel, North Carolina State College of Agriculture and Engineering Division of College Extension, P.O. Box 5125, Raleigh, North Carolina.

. . . **22-26**—Annual Conference of the Society of Photographic Scientists and Engineers, Arlington Hotel, Binghamton, N.Y. Contact SPSE, Box 1609, Main Post Office, Washington, D.C.

. . . **5-9**—Basic QC Course for the Graphic Arts Industry, Rochester Institute of Technology, Rochester, N.Y., contact Harold Kentner, Director, Extended Services, RIT, Rochester, New York.

. . . **7-17**—Design of Experiments Course, Charles R. Hicks, instructor, Purdue University, Lafayette, Ind., contact Statistical Laboratory, Engineering Administration Bldg., Purdue University, Lafayette, Indiana.

. . . **11-23**—Reliability Institute, University of Connecticut, Storrs, Conn., contact Richard M. Story, Jr., University of Connecticut, Storrs, Connecticut.

. . . **12-21**—Basic QC Course for the Chemical Industry, Rochester Institute of Technology, Rochester, N.Y., contact Harold Kentner, Director, Extended Services, RIT, Rochester, N.Y.

. . . **22-29**—Advanced QC Course for the Chemical Industry, Rochester Institute of Technology, Rochester, N.Y., contact Harold Kentner, Director, Extended Servies, RIT, Rohcester, New York.

CONSULTING SERVICES

Responsibility of the American Society for Quality Control, Inc., for Consulting Services advertising is limited to certification that advertisers hold the grade of membership in the Society stated in their advertisements. Qualification requirements for the several grades of memberships are set forth in the Constitution of the Society. Business card ads are available only to members of the Society—12 insertions $75.00; 6 insertions $50.00.

VENDOR SURVEYS-INSPECTION
A National Organization with Engineers in Nine Key Centers Coast to Coast.
Write for Schedule of Fees
R. CALVERT HAWS, Member, ASQC
QUALITY CONTROL ENGINEERS, INC.
6399 Wilshire Blvd., Los Angeles 48, Calif.

WYdown 3-2234
JOSEPH MOVSHIN
Fellow ASQC
Management Service To Supplement Your Staff
9220 Old Bonhomme Rd. St. Louis 32, Mo.

Quality Control Consultant
THOMAS A. BUDNE
Fellow, ASQC
3 Dunster Road Great Neck, N.Y.

EDWARD A. REYNOLDS
Fellow, ASQC
LIGONIER PA.

R.R. 1, Box 255
Greenwood, Indiana
SUTHERLAND-JACOBSON & ASSOCIATES
Consultants in Quality Control
Inspection Procedures, Process Controls, Statistics for Research and Development
M. L. SUTHERLAND, Ph D., Fellow ASQC
H. J. JACOBSON, Fellow ASQC

BERNARD HECHT
Quality Control & Reliability Specialist
Fellow, ASQC
Planning and Staffing Q. C. Organizations
Training in Statistical Methods
Quality Assurance Programs
5410 Wilshire Blvd. Los Angeles 36, Calif.
WEbster 8-0121

Training Programs
Consultant to Consultants
STATISTICAL ENGINEERING INSTITUTE
F. E. SATTERTHWAITE, DIRECTOR
Fellow, ASQC
8 Fuller Road
Wellesley 81, Mass. CEdar 5-6335

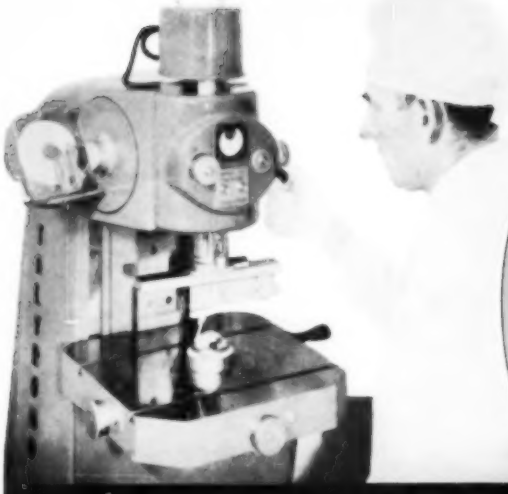
Consulting Services in Quality Control
Since 1945
RALPH E. WAREHAM
Fellow, ASQC
122 Orchard Ridge Telephone
Chappaqua, New York CEntral 8-3715

FRANK H. SQUIRES
Fellow, ASQC
Consultation
Reliability Organization
Quality Control System 4700 Crenshaw Blvd.
Cost Control Los Angeles 43, Calif.
Surveys, Training AXminster 1-3213

QC Planning Defect Prevention
LEONARD A. SEDER
FELLOW ASQC
267 HAWTHORNE ST.
MALDEN MASS.
DAvenport 4-5446
Organizing for Quality Training

Quality Control Consultant
HARMON S. BAYER
Fellow, ASQC
1154 Book Building Telephone
Detroit 26, Michigan WOodward 5-3796

Management Controls
FOUNDED IN 1948
References and Literature on Request
Senior Partner: 690 Rose Ave.
W. E. JONES DES PLAINES, ILL.
Fellow, ASQC Vanderbilt 4-1317



METROLONICS INC.

ROUNDNESS MEASURING SERVICE

ONE MILLIONTH ACCURACY

METROLONICS
ROUNDNESS MEASURING SERVICE
is performed on a Model 50 'Talyrond' with a one millionth runout spindle.

ACCURATE MEASUREMENT OF:

- **ROUNDNESS**
- **TAPER**
- **ECCENTRICITY**

MAGNIFICATION:
Up to 10,000 times

Accurate configuration measurements can be made on parts and components of the following dimensions:

- EXTERNAL DIAMETERS: .0625 to 12.000 inches
- INTERNAL DIAMETERS: .1250 to 12.000 inches
- HEIGHT: Up to 10.000 inches

Accurate Measurement of Flatness up to 12 inches Diameter

Every **METROLONICS** ROUNDNESS MEASUREMENT is provided on a 4½ inch Polar Chart on which 0.1 inch represents .000025 inch at 4000 magnification, or .000010 inch at 10000 magnification.

For a quotation on your ROUNDNESS MEASURING REQUIREMENTS, call . . .

METROLONICS SERVICES ARE

- **FAST**
- **ACCURATE**
- **ECONOMICAL**

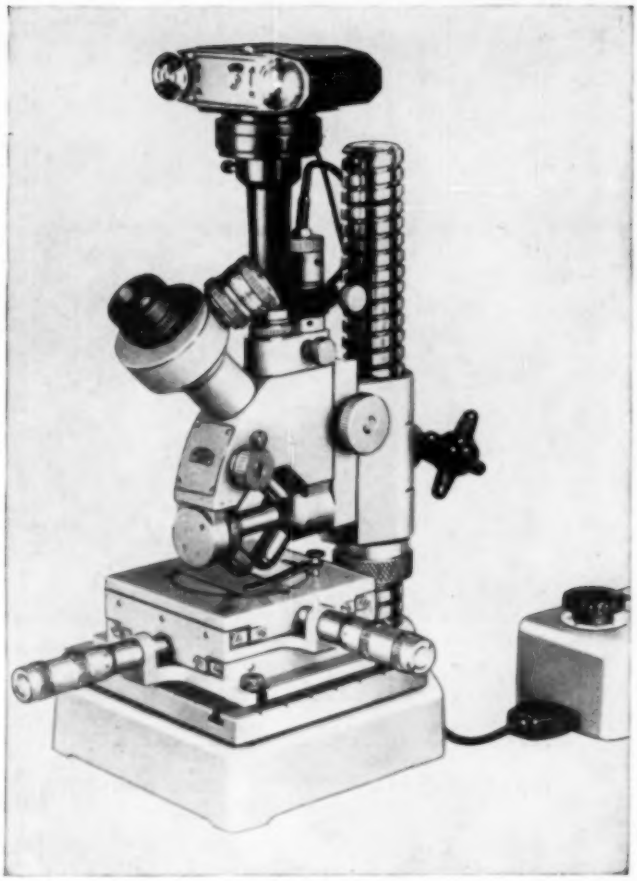
The Nation's First and Finest Independent Standardizing Laboratory

METROLONICS INC.
2201 North Hollywood Way
Burbank, California
Victoria 9-6247

CARL ZEISS

WEST GERMANY

Light Section Microscope



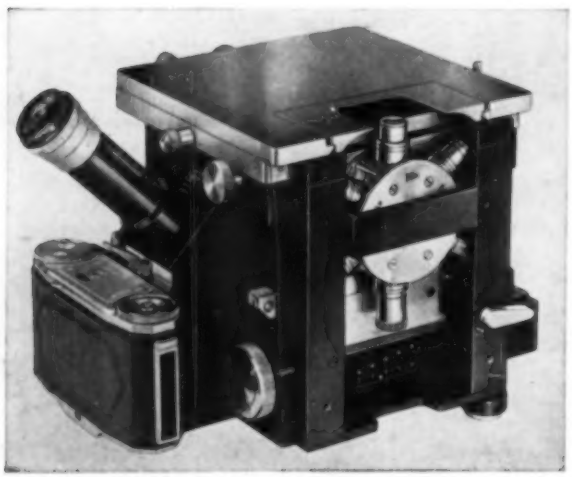
This microscope produces a profile of the surface being examined by the well known light-section method. Roughness depth, as well as the groove distances of machine-finished surfaces, can be measured. Internal surfaces can be examined by making *lacquer replicas.*

The newly developed revolving nose-piece for the objectives makes it possible to quickly change the magnification (height of profile) between 400x and 200x. At 400x, depths of roughness of 40 to 160 micro inches can be measured; at 200x, those of 120 to 4,000 micro inches.

Photographs for comparison and control purposes can be taken by mounting a 35mm miniature camera at top of the instrument.

In addition to the stage plate of the stand, a mechanical stage and center cradle (for turned parts) are available.

Interference Microscope



for measuring minute depths of roughness

(80 to 1.2 micro inches)

This instrument, which has magnifications of 80x, 200x, and 480x, is designed especially for critical examination of super-finished surfaces, thickness of coatings, changes of surface structures due to wear, impact, stress, strain, corrosion, as well as for the studying of polished and etched metallurgical specimens.

It is equipped with built-in Thallium and white light illuminators.

A miniature camera, which is attached, provide photographs on 35mm film (1x1½").

Write for detailed literature on these instruments

CARL ZEISS, INC.

485 FIFTH AVENUE, NEW YORK 17, N. Y.

COMPLETE SERVICE FACILITIES